NEW ZEALAND JOURNAL OF
Agriculture
AUGUST - 1954

AGRICULTURAL COLLEGE
27 OCT 1954

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Volume 89
Number 2
16 August
1954.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Rt. Hon. K. J. Holyoake,
Minister of Agriculture.

This Month's Cover

This month's cover, which has been reproduced from a colour photograph by D. R. Brenchley, shows the sowing of pasture seed and fertiliser on the Waihuka block, an area of 4700 acres being developed by the Land Development Branch of the Department of Lands and Survey. The country shown, which is about 2 miles from Ongarue on the North Island main trunk railway, was broken in from manuka scrub about 4ft. high. The Waihuka block is to be subdivided into 5 sheep farms, the first of which is to be taken up this year.

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SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 10s. a year; the overseas subscription is 13s. (sterling). The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available from Publications Section, P.O. Box 2298, Wellington, at 1s. a copy, post free.

Subscription inquiries (preferably accompanied by the address cut from a recent "Journal" wrapper) should be sent to the nearest office of the Department of Agriculture.

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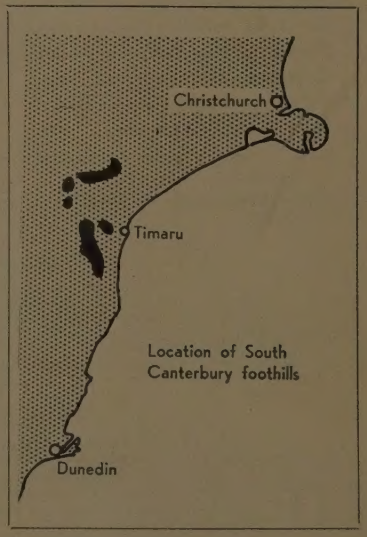
REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

South Canterbury Foothills Survey

THE dominance of browntop in the plant cover of a large area of the rolling downs and the slopes of the Hunters Hills in South Canterbury led to this region being familiarly termed the "Browntop Belt" and the "Hungry Hunters", names synonymous with hardship and poor credit risk. This article describes some of the results of two farm management and economic surveys made of the area in 1938-39 and 1949-50. The first survey was made by E. M. Ojala, then Instructor in Agriculture, Department of Agriculture, and the second by the economic staff at Christchurch under the direction of R. C. Stuart, Agricultural Economist, Department of Agriculture, Christchurch. The section describing the soils of the area was written by J. D. Raeside of the Soil Bureau, Department of Scientific and Industrial Research, Dunedin.

THE South Canterbury foothills are part of the foothills belt which extends almost continuously through Canterbury and which consists of a fairly narrow strip of undulating to hilly country lying between the high, mountainous country and the plains and lower downs country. The area is mainly easy rolling country and except for small areas which are too steep for cultivation is nearly all ploughable.

The survey was confined to that portion of the foothills and downs stretching southward from Geraldine to Waimate and included the districts of Woodbury, Claremont, Cannington, Maungati, Bluecliffs, and Hunter, which are typical of approximately 82,000 acres of foothills and downs country. The region consists mainly of easy rolling downs in the form of low spurs running out from the bases of the hills. Lying between these spurs are restricted areas of flat land, mostly covered with stony soils. The highest altitude is 1200ft. at Sherwood Downs and on top of Mt. Horrible, but most of the area is under 800ft.



Climate

The annual rainfall over the greater part of the foothills is between 25in. and 30in., increasing to 40in. to 45in. on the higher areas. The distribution is even, though the average monthly rainfall figures show that the greatest precipitation is usually in December, January, and February. However, the effectiveness of the summer rainfall is often reduced considerably by dry north-west winds which are prevalent at this time of the year. Also records show there are considerable variations from these average monthly figures, as was instanced in February 1945, when the mean rainfall over much of the South Canterbury foothills was 13.5in. compared with the average of 2.7in.

Frequent fogs and mists make conditions cold and damp. There is also the possibility of frosts in any month; though they are rare in January and February, they are frequent and severe from May to September. Clear, sunny days which usually follow the frosts are sometimes marred by cold south-easterly and south-westerly winds. In winter snow often falls on the higher country with south-westerly storms.

Soils

The soils of the district are yellow-grey earths formed on greywacke or sediments derived from greywacke rocks. Most of the undulating and hilly land is covered with a deep deposit of loess-like silt, with the underlying rocks, limestones, and sandstones outcropping only on the steep sides of gullies. Greywacke outcrops are found on some of the hilly and rolling land near Kakahu where soils are formed directly on the rock. On the higher river terraces (for example, near Skipton) soils are formed on alluvium which has characteristics similar to the loess of the downs.

Yellow-grey earth soils are formed under winter conditions which are moist and cool and summer conditions which fluctuate rapidly between dry and hot when the fohn winds are blowing, to moist and mild when the easterly winds bring rain and mist over the foothills. These fluctuating summer conditions produce rapid changes of moisture status in the soils and profile characteristics which are typical of soils formed under this type of climate.

The main features of these soils are:—

1. Compact, blocky, yellow subsoils of silty clay loam texture.
2. Strongly mottled and often iron concretion horizon above the

compact subsoil and below the topsoil. This horizon has a texture ranging from silt loam to silty clay loam, and colours ranging from yellow to pale grey. Concretionary formations are particularly well developed on sites where there is excessive waterlogging and where seepages occur on the lower slopes of hills and downs.

3. Topsoils ranging in colour from brownish grey to pale grey of silt loam texture. Topsoil depths in the natural state range from 8in. on the lower, drier land to 5in. on the higher, wetter land. The topsoils have relatively poor structures which readily break down under bad management.

The soils are classified as follows:—

Yellow-grey Earths

Moderately leached: Claremont.

Strongly leached: Opuha, Sherwood, Skipton, and Kakahu.

The distribution of these soils in South Canterbury between the Orari River and Waimate is shown on the map on this page.

Claremont Soils

Claremont soils are formed on loess in the drier and lower parts of the South Canterbury foothill country. Average annual rainfall ranges from 26in. to 32in. On undulating slopes where the soil is well drained the topsoil is a grey-brown silt loam of medium to weak structure overlying yellow-grey mottled silt loam and a compact yellowish massive pan at 15in. to 18in. On flat or gently sloping land where drainage is poor the topsoil is thinner and paler and the subsoil is whitish grey with many orange mottles and iron nodules. Claremont soils respond well to lime and phosphate.

Opuha Soils

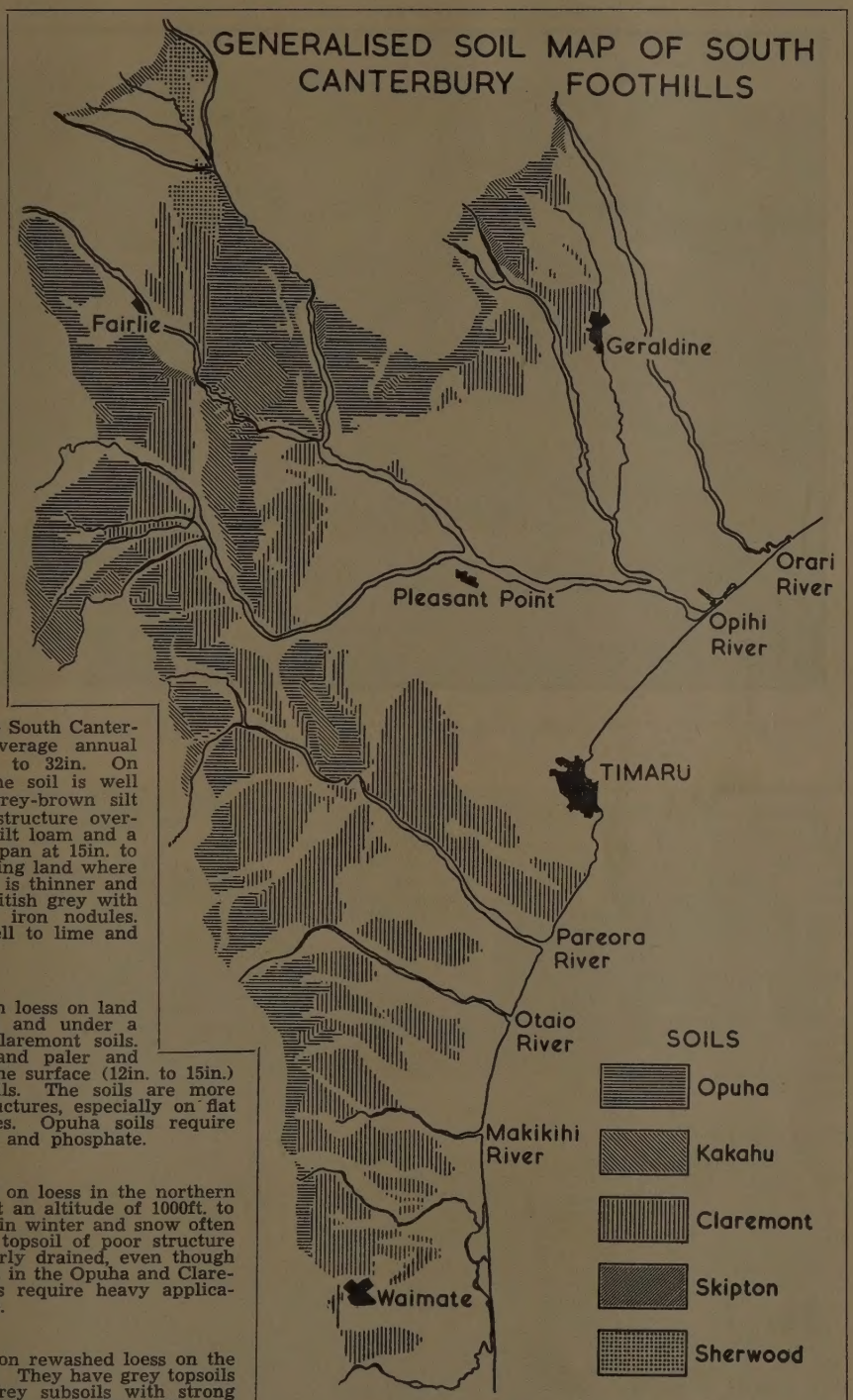
Opuha soils are formed on loess on land usually at higher altitudes and under a wetter climate than the Claremont soils. The topsoil is shallower and paler and the pan is often closer to the surface (12in. to 15in.) than in the Claremont soils. The soils are more mottled and have poor structures, especially on flat and gently undulating sites. Opuha soils require heavy topdressings of lime and phosphate.

Sherwood Soils

Sherwood soils are found on loess in the northern parts of the Fairlie basin at an altitude of 1000ft. to 2000ft. The climate is cold in winter and snow often falls. The soil has a grey topsoil of poor structure and the soils are often poorly drained, even though the pan is not as compact as in the Opuha and Claremont soils. Sherwood soils require heavy applications of lime and phosphate.

Skipton Soils

Skipton soils are formed on rewashed loess on the terraces near the mountains. They have grey topsoils and pale grey to yellow-grey subsoils with strong mottling. They have a hard pan at 15in. The soil waterlogs readily and should be mole drained. Skipton soils are of low fertility and require topdressings of lime and phosphate.



[From a map supplied by Soil Bureau, Department of Scientific and Industrial Research, Dunedin

The region consists mainly of easy rolling downs in the form of low spurs running out from the bases of the hills and much of it is ploughable.

Kakahu Soils

Kakahu soils are formed in part on greywacke bedrock and in part on loess. They occur mostly on the Brothers Range east of Fairlie at altitudes above 800ft. The soil has a poor structure and it is difficult to maintain good tilth. There is a weakly developed hard pan, but the soils are relatively free draining. Kakahu soils are strongly leached and require heavy topdressings of lime and phosphate.

Access

Much of the foothills area lies some distance from railways and from main centres. Though quite good metal roads are common in the area, the isolation is reflected in the lack of amenities and creates problems of labour and operation costs. Cartage costs are a large item of expense on most properties.

History of Farming

Like most of Canterbury the foothills were originally included in very large holdings which were farmed under a system of extensive grazing with Merino and half-bred sheep producing wool for export and later mutton. As population increased and a demand arose for flour some areas of wheat were grown and there was subsequently some subdivision of holdings. However, it was not until the first decade of the present century that any real change in the organisation of farming in the region took place.

With its policy of closer settlement at this period the Government repurchased large blocks of this country and this programme was continued until the early 1920s to assist with the settling on the land of returned soldiers after the First World War. The land was purchased at inflated values and subdivided into relatively small units, many of them being between 200 and 300 acres. The sections were offered for selection on a renewable lease-hold tenure as "good agricultural land". The rents charged were consistent with this description and they were also in line with the Crown's purchase price.

If the foothill country had been in fact "good agricultural land", the changes would probably have laid the foundations for its continued progress and prosperity. Because of the high overhead charges for rent and mortgage interest which had to be met and the alleged suitability of their land for agricultural purposes, these new foothill settlers began a system of intensive cereal cropping which was characteristic of much of the Canterbury Plains. Under this system reliance was placed on cereal crops for regular income, this being supplemented by receipts for wool and lambs from the breeding ewes run on short-term rotational pastures.

Many soon found that the rents which they were required to pay were beyond the capacity of their holdings as then farmed and two courses were adopted, the first being to apply to the Government for a remission of any outstanding rent or for revaluation of the land, and the second to adopt a more intensive concentration on cereal cropping. The latter offered only temporary economic relief and resulted in depletion of the little natural fertility which the soil possessed. A number of settlers became discouraged and holdings were abandoned or the leases forfeited by the Crown.

It was not until the mortage relief legislation of the 1930s, which culminated in the Mortgagors and Lessees Rehabilitation Act of 1936, that real economic relief was given. Under this legislation rents and mortgages were reduced in line with the then productive capacity of the land. Also there was a realisation by the Crown and the State Advances Corporation, which was the largest mortgagee in the area, that the original subdivisions were too small and endeavours were made to enlarge the existing holdings by the reallocation of forfeited leases to remaining Crown lessees and also by a voluntary scheme of regrouping of Crown leases.

Sizes of Farms

The sizes of farms in the region have been measured on the basis of area and on the basis of stock units carried.

TABLE 1—FARM SIZES IN ACRES

Size of farm acres	1938-39		1949-50	
	Number of farms	Percentage	Number of farms	Percentage
0 and under 100	—	—	—	—
100 and under 200	4	6	3	6
200 and under 300	14	19	2	4
300 and under 400	17	24	5	10
400 and under 500	9	13	8	16
500 and under 600	4	6	3	6
600 and under 700	3	4	9	17
700 and under 800	8	11	6	12
800 and under 900	4	6	2	4
900 and under 1000	0	0	1	2
1000 and over ..	8	11	12	23
	71		51	

In 1938-39 the modal or most common range of farm size was between 300 and 400 acres, 24 per cent. of the farms falling in this group. Though the number of farms was not great, there appears to have been a second mode in the range 700 to 800 acres. This is interesting, for 700 to 800 acres of foothill land farmed mainly as a grazing proposition approximates an economic unit; that is, an area capable of fully utilising and adequately rewarding the labour of one man. The table shows that 72 per cent. of the farms in 1938-39 were too small to be economic if managed as dominantly pastoral units and the farmers were forced into unsuitable types of farming.

In 1949-50 the trend was toward larger holdings as a result of the policy of amalgamation, but if 700 to 800 acres is considered an economic unit, the table shows there were still 59 per cent. of the units which were uneconomic.

Table 2 shows the sizes of farms according to the number of breeding ewes carried.

TABLE 2—FARM SIZES MEASURED BY NUMBER OF BREEDING EWES CARRIED

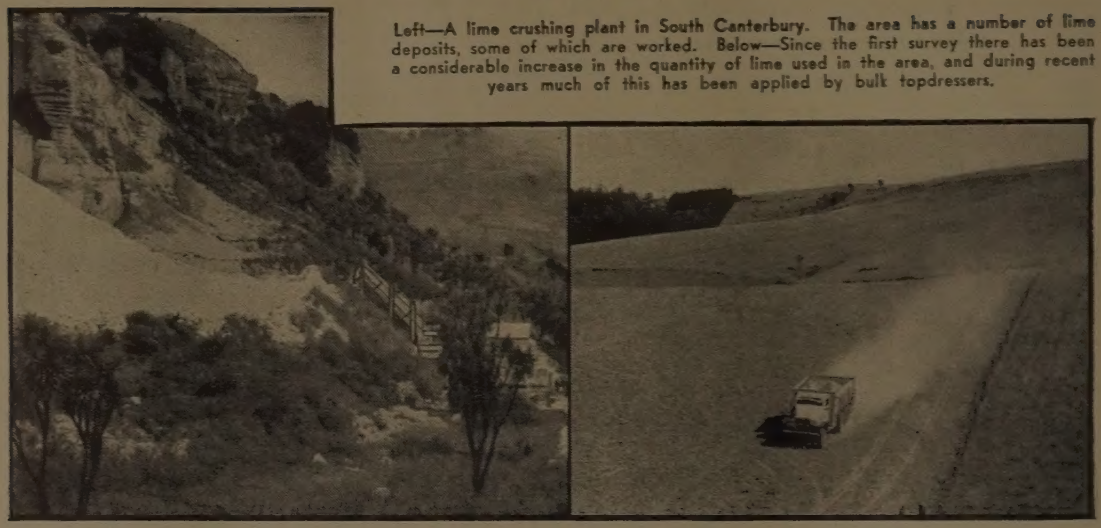
Number of breeding ewes on farms	1938-39		1949-50	
	Number of farms	Percentage	Number of farms	Percentage
0 and under 100	1	2	—	—
100 and under 200	6	9	—	—
200 and under 300	6	9	2	4
300 and under 400	11	16	2	4
400 and under 500	7	11	3	6
500 and under 600	8	12	2	4
600 and under 700	6	9	5	10
700 and under 800	1	2	11	21
800 and under 900	5	7	4	8
900 and under 1000	5	7	6	12
1000 and under 1100	1	2	5	10
1100 and over ..	9	14	11	21
	66		51	

There has been a definite trend toward larger flocks since 1938-39 and if it is assumed that 800 breeding ewes is the minimum economic flock on this country, 70 per cent. of the holdings would be classed as uneconomic in 1938-39 and 49 per cent. in 1949-50. No account has been taken of cereal cropping and pasture seed production, which do improve the position of some of the smaller farms without making them really economic units.

Systems of Farming

Though in 1938-39 some of the land was utilised as winter areas for hill country stock and some as extensive browntop grazing runs, no special economic difficulties were associated with these two systems of farming. The predominant system of farming in the region was that of grazing and cropping, and the Crown lessees as well as the smaller freehold farms came under this heading. Many of the holdings had more than one-third of their total areas under cultivation each year. The carrying capacity was slightly over 1 ewe per acre over the whole region and the main sources of revenue were from the

A typical view of the South Canterbury Browntop Belt, the name given to a large area of the rolling downs and the slopes of the Hunters Hills.



Left—A lime crushing plant in South Canterbury. The area has a number of lime deposits, some of which are worked. Below—Since the first survey there has been a considerable increase in the quantity of lime used in the area, and during recent years much of this has been applied by bulk topdressers.

sale of lambs, wool, cull ewes, and cereal crops, which were occasionally augmented by the sale of browntop seed.

The outlay for seeds and manure took a great part of the farm income, and on those farms where it was the practice to buy flock replacements each year the income was still further reduced. Under such conditions some farmers carried on simply by neglecting repairs and maintenance and accepting a lower standard of living for themselves and their families.

A few progressive farmers, however, had already realised that in order to increase their carrying capacity it was essential first to establish a leguminous dominant pasture in place of the customary low-producing browntop sward. By embarking on an extensive liming programme and using Certified pasture seeds and phosphatic manures, these farmers were soon able to increase their stock numbers with considerable benefit to their incomes. This lead, coupled with a rising market for wool and fat lambs, accelerated the swing to better grassland farming, which was so necessary to the economy of the foothills.

The period during the Second World War was, however, one of consolidation rather than rapid expansion, the main features being the stabilisation of ewe flocks and the amalgamation of holdings. Though revenue was not increased, most farmers concentrated on building up flocks of Romney ewes and sold only cast-for-age ewes and wether lambs. Whenever possible they acquired, either by purchasing or leasing, any available land and there was keen competition for tussock blocks.

Part of the country comprises steep gullies and faces which cannot be cultivated. Gorse has spread on to many of these steep parts.

The 1949-50 survey confirmed the establishment of better grassland farming, with a little cereal cropping and pasture seed production confined to the lower-rainfall areas. Most farmers were now concentrating on the production of fat lambs, wool, and cull ewes, with some beef cattle production. It is significant that the 1938-39 survey showed that revenue from cattle was not great, nor was the practice of running cattle widespread. This was true also in the 1949-50 investigation, which revealed that though beef cattle production had increased, it was still not widespread, but was confined to the more highly developed farms in a few districts. Where land development was making only slow progress, or had just begun, it was noticeable that no cattle were carried and no thought had been given to using them for increasing revenue. As land development progressed and surplus feed became available on the good established pastures farmers purchased cattle as a complement to their breeding flocks. Throughout South Canterbury beef cattle numbers increased by approximately 40 per cent. between 1938-39 and 1949-50.

Pasture and Grassland Management

Table 3 shows the changes which have taken place in the pasture cover of the area.

TABLE 3—CLASSIFICATION OF PASTURES ON FARMS

Classification	1938-39		1949-50	
	Area acres	Per cent. of total area	Area acres	Per cent. of total area
Total area of farms ..	40,673		41,089	
*Total effective area of farms	37,826		38,290	
New grass under 1 year	2,996	7	1,480	4
Predominantly browntop .	18,696	46	7,272	18
Sown pasture 1 year and older	4,494	11	14,830	36
Tussock and roughage ..	7,636	19	6,781	16
Other land	6,851	17	10,726	26

* The effective area is equal to the total area of the farms less the area completely covered in scrub and gorse and the area occupied by farm dwellings and buildings and plantations.

To appreciate the real differences between the pastures during the two periods a reference to the description of the pastures is necessary. The 1938-39 investigation described the pastures on nearly every farm as "sown grassland in progressive stages of reversion to browntop" or "dominantly browntop with some sweet vernal, couch, and fog; for the most part clovers and ryegrass are conspicuous by their absence". On the other hand the area shown as sown pasture in 1949-50 could be described as good ryegrass-white clover dominant pastures, and as such mark a great change in the foothill landscape.

Foothill farming is now dependent on the establishment, maintenance, and control of good pastures; in the past it was the aggressiveness of browntop which was the chief obstacle to more productive pastures. Because of conditions of low fertility brought about by excessive cropping, bad drainage, and acidity, the foothills provided an almost ideal environment for browntop. Its dominance was such a regular feature of all this country that the territory was, and still is, referred to as the Browntop Belt.

Table 3 shows that there has been a marked decrease in the area of new grass sown, indicating that pastures are now longer lived. In 1938-39 one-ninth of the grassland was sown. In 1949-50 approximately one-seventeenth of the grassland was sown. This represents a saving to the farmers in the area, as they devoted a considerable amount of time, labour, and expense to pasture establishment.

TABLE 4—TOPDRESSING PRACTICE ON SURVEYED FARMS

	1938-39		1949-50	
	Lime	Superphosphate	Lime	Superphosphate
Area topdressed (acres)	1,666	1,701	6,746	3,645
Percentage of grassland topdressed ..	8	8	23	12
Total quantity used (tons)	787	126	6,784	291
Average dressing per acre (cwt.)	9½	1½	20	1 3/5

Table 4 shows that the main change since 1938-39 is the considerable increase in the quantity of lime used, from 787 tons to 6784 tons. In 1949-50 lime was used on 49 of the 51 farms visited, but in 1938-39 only 24 of the 71 farms included in the survey used any lime or did any topdressing with fertilisers.

If the total quantity of lime and manures used that year had been spread over the whole of the available grassland, each acre would have received approximately 76lb. of lime and 12lb. of superphosphate. Though many did not appreciate the value of liming and topdressing, those who did neither had the money nor could obtain sufficient credit to lime or topdress their farms.

The table indicates that in 1949-50 the farmers appreciated the value of lime, but many failed to realise that to maintain pastures in good heart and to prolong the productive life of their grassland it was just as necessary to topdress with superphosphate. Though only two farmers failed to lime their land, 24 did not topdress with superphosphate after the pasture had been established; also, of the 291 tons of superphosphate used as topdressing, nearly 100 tons were used on one of the large sheep stations.

Before the carrying capacity of the foothills can be increased to any great extent, despite the considerable improvement in the quality of the pastures, the farmers will have to appreciate more fully than they do the necessity and benefits of pasture control. The 1949-50 season in the foothills may have been an exceptional one with much earlier and better growth than is usual, but on the majority of farms ewes and lambs were running in long feed. Foot-rot was prevalent and the lambs were not thriving on the long, rank growth. Few farmers made hay out of the surplus growth and there has been little change in this direction since 1938-39.

In that season 195 acres of grassland and 13 acres of lucerne spread over 11 farms were cut for hay, and in 1949-50, 240 acres were saved for hay, of which 78 acres were lucerne.

Tussock and Roughage

A portion of the country comprises steep gullies, spurs, and steep faces, and it cannot be cultivated easily. Of the total area of 41,089 acres covered in the 1949-50 survey, 6781 acres, or 16 per cent., was in this category. The major part of this area is in tussock which is used for running dry sheep in summer or as a winter run-off for ewes. As these tussock blocks are limited in number, there is keen competition among foothill farmers for them. The remainder of this class of country can be termed "roughage", that is, the cover is scrub, gorse, and rough grazing, which has little feed value and reduces the effective area of a holding. A part of it can be improved provided the right type of heavy machinery is used, but few of the farmers in the area could undertake the work without financial assistance.

The second survey showed that the area set aside for hay had increased slightly, but there is still a lack of appreciation of the modern techniques of grassland management, one of which is the conservation of surplus pasture growth for hay or silage.

Cropping

The ploughing and cultivation of a relatively large area of land each year for crops was, and still is, a feature of farming on the foothills and this cultivation plays a considerable part in the life of a foothill farmer.

TABLE 5—AREA IN CROPS ON FARMS

Crop	Area		Percentage of total area of farms in surveys	
	1938-39 acres	1949-50 acres	1938-39	1949-50
Wheat	732	1,048	1.8	2.5
Oats	1,535		3.8	
Other cash crops ..	76		0.2	
Root crops	2,724	2,556	6.7	6.2
Greenfeed	567	441	1.4	1.1
Rape	1,062	1,454	2.6	3.6
Total	6,696	5,499	16.5	13.4

Only a small area of oats is now grown, but the crop was once important to provide chaff for working horses, and it was not uncommon for oats to be sown in early autumn to provide greenfeed for sheep in late autumn and again in spring, and to be finally harvested in summer. Wheat is still the most important cash crop, particularly on the smaller farms. Though many parts of the typical foothill country are not well suited to wheat growing, in 1949-50 on the smaller uneconomic farms the revenue from wheat formed a considerable part of the gross farm income. The main feature shown by the table is the smaller part which cash cropping plays in farm management in the area than it did earlier. In 1938-39 cash crops occupied 5.8 per cent. of the total farm area, and in 1949-50 they occupied only 2.5 per cent.

Of the supplementary feed crops roots are the most important, and though turnips were popular in 1938-39, swedes are now the main root crop. In both surveys root crops occupied more than 40 per cent. of the total cultivated area.

The increase in the area of rape sown is consistent with the trend in fat lamb production and the fattening of lambs on feed.

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Breeds of Sheep

The Romney cross ewe is used extensively in the area and has proved ideal for local conditions. In 1938-39 the ewe flocks on 66 farms were 79 per cent. Romney, 18 per cent. threequarter-bred, and 3 per cent. half-bred. By 1949-50 the ewe flocks on 51 farms were 94 per cent. Romney, 4 per cent. threequarter-bred, and 2 per cent. half-bred.

The Romney breed also predominated in rams used. In 1938-39 the percentages of the various breeds of rams used were Romney 50 per cent., Southdown 18 per cent., English and Border Leicester 4 per cent., and mixed breeds and crossbreds 28 per cent. In 1949-50 of all rams used Romneys represented 61 per cent., Southdowns 2 per cent., and various breeds and crossbreds, including Southdown with other breeds, 37 per cent.

Replacement Policy

The general practice disclosed by both investigations was to breed replacements on the farm, to sell surplus ewe hoggets, and to cull flock ewes at 4 and 5 years old. A ready market for cast ewes from the foothills has always existed among fat lamb producers on the plains. In 1938-39 replacements were bought in on 25 per cent. of the 66 farms either as ewe lambs or hoggets, 61 per cent. bred their replacements, and 14 per cent. bred and purchased replacements.

In 1949-50 only 18 per cent. of the 51 farms bought in replacements, mainly as hoggets and 2-tooths, 78 per cent. bred replacements, and 4 per cent. purchased and bred their requirements.

Lambs

On most farms lambing started about the middle of September, but quite a few farmers delayed lambing until the first week of October. The average percentage of lambs tailed for all farms was 97 per cent. in 1938-39 and 1949-50. The number of lambs taken fat off the mothers was approximately 10 per cent. for both periods, though in 1949-50 one farm had over 50 per cent. of lambs fat off the mothers.

In 1938-39 at least 50 per cent. of the 66 farms sold all surplus lambs as stores, but in 1949-50 only 14 per cent. of the surveyed farms sold their lambs as stores and 39 per cent. sold the lambs fat off feed.

Carrying Capacity

Though most of the farms covered in the surveys showed considerable improvement in the quality of pastures, the carrying capacities had increased very little. In 1938-39 the average carrying capacity of 66 farms was a little over 1 breeding ewe per acre and in 1949-50 it was approximately 1¼ breeding ewes per acre. The figures for total sheep had increased from 1¼ per acre to 1½ per acre over the same period.

Economic Aspects

The basis of this economic analysis is provided by statistics of costs and returns for the farms included in the farm management section. The observed differences between the two seasons 1938-39 and 1949-50 are an indication of the nature and extent of the economic changes which are taking place throughout a considerable part of the South Canterbury foothill districts.

Farm Capital

The division of farm capital into the three main components, plant and machinery, stock, and land and improvements is shown in Table 6.

TABLE 6—DIVISION OF FARM CAPITAL

	1938-39		1949-50	
	Amount £	Percentage of total farm capital	Amount £	Percentage of total farm capital
Plant and machinery ..	44,855	9	87,925	14
Stock	89,976	20	184,829	31
Land and improvements	336,580	71	336,301*	55
Total farm capital	471,411		609,055	
Total farm capital per acre ..	11.6		14.8	
Total farm capital per ewe ..	10.8		11.7	

* The value of £336,301 was the Government valuation at the time of the survey, but since then a revaluation has been made and the Government valuation of the properties is now £632,410.

For land and improvements recent Government valuations were obtained. Plant and machinery were valued at clearing sale prices and stock at conservative market rates—the same basis as was used in the 1938-39 survey.

In 1938-39 land and improvements formed 71 per cent. of total farm capital and in 1949-50 they represented 55 per cent. Stock, plant, and machinery in the latter year took up 45 per cent. of the total farm capital against 29 per cent. in 1938-39. In spite of the considerable increase in total farm capital, however, the average increase on a per acre basis is only from £11.6 to £14.8, and per breeding ewe

On some of the more highly developed farms in the district beef cattle are now run, but the practice is not widespread.

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Though tractors have largely replaced horses in the South Canterbury foothills, there are still a few horse teams.

from £10.8 to £11.7. On the small farms the farm capital invested in 1949-50 was almost £20 per acre, which illustrates the heavier capital loading these farms have to carry and the necessity for a high degree of efficiency in the utilisation of all assets to achieve economic stability.

The 1949-50 survey showed that plant and machinery were reasonably well cared for, but most buildings required considerable repairs and in some instances they were old and inadequate.

Gross Farm Income

Gross farm income in Table 7 comprises the receipts from livestock, crops, and other products sold during the 1938-39 and the 1949-50 seasons, plus or minus an adjustment for any change in stock on hand between the beginning and end of the farming year.

TABLE 7—GROSS FARM INCOME ON SURVEYED FARMS

	1938-39		1949-50	
	Amount £	Percentage of gross farm income	Amount £	Percentage of gross farm income
Wool	17,622	24	91,490	39
Fat lambs	19,634	27	48,456	21
Store lambs			20,050	9
Cull ewes	5,841	8	23,483	10
Other sheep	13,471	19	2,182	1
Total sheep returns	56,568	78	185,661	80
Crops	8,941	12	16,177	7
Pasture seeds	—	—	6,419	2
Cattle	2,729	4	8,432	4
Miscellaneous receipts	4,444	6	7,691	3
Total receipts	72,682	100	224,380	96
Plus stock accumulations	—	—	9,009	4
Gross farm income	72,682	100	233,389	100
Gross farm income per acre	25s.		111s.	
Gross farm income per ewe	34s.		90s.	

Sheep have always been the main source of income, contributing 78 per cent. of the total income in 1938-39 and 80 per cent. in 1949-50. The other item of importance was cash crops, which in 1938-39 contributed 12 per cent. of the gross farm income, but this had fallen to 7 per cent. in 1949-50.

As an indication of the increase in prices it is interesting to note that in 1938-39 lambs (including stores) brought 18s. and cull ewes 14s. 9d. per head.

Farm Expenditure

Under the heading of farm expenditure are included all the routine expenses involved in operating the farm and maintaining the farm assets plus an allowance for depreciation at set rates. The wages of hired or family labour are included, but no allowance is made at this stage for rewarding the farmer for his own work.

Some of the farms studied were freehold, some leasehold, and some of mixed tenure. No attempt was made to inquire into the farmers' indebtedness. Because of the variation in these points it was decided to use a standardised method of analysing the farm accounts, so that comparisons could be made between farms or groups of farms. For this purpose all farms were regarded as debt-free and freehold. Thus payments of interest or rent were excluded from the total of working and maintenance expenses. However, on the assumption that a farm should earn interest on the working capital, a standard allowance was included on all farms under working expenses for interest at 4½ per cent. on the value of stock and chattels.

TABLE 8—DIVISION OF FARM EXPENDITURE ON SURVEYED FARMS

	1938-39		1949-50	
	Amount £	Per cent. of total farm expenditure	Amount £	Per cent. of total farm expenditure
Cultivation and harvesting	3,786	7	3,705	3
Seeds	2,893	5	6,824	5
Lime and manures	5,170	10	19,216	15
Stock feed purchased	1,979	4	2,155	2
Repairs and maintenance	1,757	3	9,105	7
Tractor, truck, and car expenses	2,626	5	12,961	10
Horse expenses	533	1	—	—
Wages and contract	8,873	16	17,104	13
Stock purchased	9,488	17	25,297	19
General expenses	1,131	2	7,255	6
Depreciation	5,376	10	8,240	6
Interest on value of stock and plant	6,067	11	12,222	9
Rates	1,883	4	3,116	2
Sundry expenses	2,806	5	4,473	3
Total expenditure	54,368	100	131,673	100

An indication of the swing to good pastoral farming was the drop in cultivation and harvesting costs from 7 per cent. to 3 per cent. of total farm expenses and the increase

for lime and manures from 10 per cent. to 15 per cent. Stock feed purchased decreased from 4 per cent. to 2 per cent. and in 1949-50 there were no horse expenses. However, increased mechanisation caused tractor, truck, and car expenses to rise from 5 per cent. to 10 per cent. and a portion of the increase from 3 per cent. to 7 per cent. for repairs and maintenance was due to the same cause.

Labour Supply

There have been several changes in the labour set-up since 1938-39, the major one being the complete displacement of family labour. In that year 32 farmers hired no labour; the remaining 34 farms employed 16 family units and 23 full-time and 10 part-time hired units. In 1949-50 only 15 farms hired no labour and the remaining 36 employed 54 full-time units.

Generally there was no acute shortage of labour, but skilled workers were not readily available and a few farmers complained of the difficulty of keeping good men. This was due partly to the fact that single accommodation only was available on most farms, but the chief obstacles were lack of social amenities, distance from any major town, and transport.

Economic Summary

Table 9 sets out briefly the results of the economic study.

TABLE 9—ECONOMIC SUMMARY FOR SURVEYED FARMS

	1938-39		1949-50	
	Per farm £	Per acre s. d.	Per farm £	Per acre s. d.
Gross farm income	1,080	35 0	4,589	114 0
Less total farm expenditure	802	26 0	2,576	64 0
Interest and management surplus	278	9 0	2,013	50 0
Less allowance for wages of management	208	6 9	416	10 0
Interest surplus	70	2 3	1,597	40 0
Less 4½ per cent. on fixed capital	231	7 6	342	7 6
Production bonus	Nil	Nil	1,245	32 6
Total number of acres ..	40,673		41,689	
Total number of farms ..	66		51	
Average farm size (acres) ..	617		805	

Interest and management surplus is the difference between gross farm income and working and maintenance expenses. As the name suggests it represents the surplus above operating costs available to pay interest on the fixed capital and to remunerate the farmer for his own labour and capital investment.

Allowance for wages and management is the sum allowed as a reward for the farmer's own work. In 1938, £4 per week was allowed, and £8 per week in 1949, but in addition the farmer would have various perquisites, such as house accommodation, meat, milk, and firewood. The same figure for each season for all farms was allowed, regardless of their size and turnover. The allowance was looked on as a reward for the farmer as a worker, not as a manager or business man.

Interest surplus: When the allowance for wages and management is deducted from the interest and management surplus the remainder is called the "interest surplus". In Table 9 the interest surplus for 1938-39 is shown as £70 per farm and for 1949-50 as £1597. This means that on these farms, after allowances had been made for depreciation at standard rates, interest at 4½ per cent. on the value of stock and chattels, and a weekly cash return to the farmer, there would have been an average of £70 per farm in 1938-39 and £1597 per farm in 1949-50 left out of the farm income to pay interest on the value of the land and improvements and to provide a "bonus" for the farmer.

Interest surplus per acre is obtained by dividing the interest surplus by the total acreage in each year. As all farms in both years are on the same soil type, interest surplus per acre is a good index of the average business efficiency in each year. After the change in money value is allowed for the difference between the interest surplus in 1938-39 and 1949-50 is due largely to the increase in the average farm size and the different farm management practices adopted.

Production bonus per acre: If the Government capital value is taken as a measure of capital sunk in land and improvements, interest at 4½ per cent. of this capital value is 7s. 6d. per acre for 1938-39 and 1949-50. The difference between this and the interest surplus per acre gives an indication of the production bonus enjoyed by the farmer as a reward for his management. No such bonus existed in 1938-39, whereas in 1949-50 there was a bonus of 32s. 6d. per acre or £1295 per farm. Not only was there no production bonus in 1938-39, but 41 farms of the 66 would have failed to meet all charges. The average carrying capacity of all these farms was only 450 ewes. This seems to illustrate that foothill land when farmed in small units had no productive value, but when farmed in large units each capable of carrying sufficient breeding ewes to make it economic, will not only provide the farmers with a reasonable standard of living but will also yield a surplus giving real productive value.

Conclusions

As a result of the amalgamation of holdings and the improvement in farm management practices over the past few years, the earning capacity of many farms has been improved. In all districts certain farms, due to better management, are highly productive and form a contrast to others. There is still room for improvement of much of the region.

Though a considerable area of the region has been sown to good pastures, there are several factors limiting development.

1. **Lack of capital:** The foothills are still regarded by some lending institutions as a poor credit risk, and unless capital is available, it will be some time before good pastures can be established on the large area of ploughable land still to be developed. Finance is necessary to pay for drainage, lime, fertilisers, good pasture seeds, machinery, extra stock, and fencing.

2. **Size of enterprise:** It has been confirmed by these surveys that units farmed as intensive grassland units capable of carrying approximately 900 breeding ewes are economic. It appears that a carrying capacity of at least 2 ewes per acre should be possible on good pasture, so that 450 acres would be the minimum farm area for intensive grassland farming. This might well be increased by 50 acres if replacements are to be run.

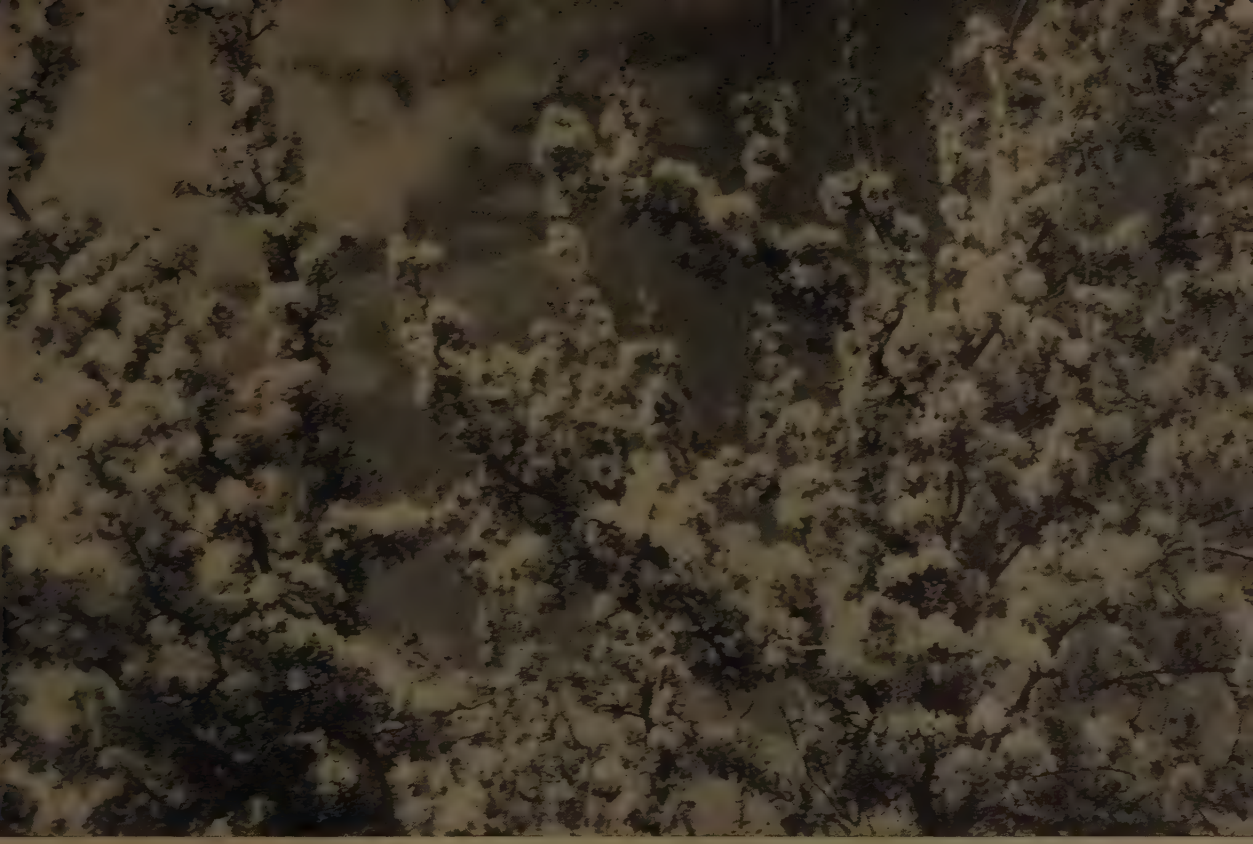
There are still a number of holdings of less than 400 acres in the region and development of these areas is likely to be unsound. If stability and economy of the foothills are to be achieved, it will be necessary to ensure that holdings are of not less than 400 acres.

3. **Labour:** The difficulty of attracting skilled farm workers is hampering development. Many farmers cannot find time to break in new country owing to pressure of routine work, but if good tractor drivers accustomed to working this type of country were readily available, greater production would result. However, the lack of suitable accommodation and transport, the distance from towns, and the general absence of social amenities do not encourage labour to the foothill region.

4. **Drainage:** As most of this country has a stiff clay subsoil and a suitable fall, mole drainage is a necessary step for further improvement. There is now a greater appreciation of the benefits associated with mole drainage and an expansion of this practice can be expected.

5. **Pastures:** There is little doubt that the basis of improvement of this browntop country has been the successful establishment of high-producing pastures. However, the improvement which has taken place is not fully reflected in increased stocking. This appears to be mainly due to the fact that the modern technique of grassland management is not fully appreciated, particularly the benefits arising from subdivision and shelter, conservation of surplus growth in spring and early summer as silage or hay, topping of pastures, and greater use of cattle to control the flush spring growth.

The foothills region has been South Canterbury's marginal area, but it is now one of the main areas where increased production can be expected.



Home Orchard in Spring

By M. G. BAUMGART, Assistant Storage Specialist, Department of Agriculture, Wellington

SPRING is a particularly busy season in the garden and often the fruit trees are neglected in favour of the vegetables and flowers. The foundations of a good crop of clean fruit are laid in spring and if correct spray and soil treatments are not applied at the proper time the crop may suffer during the current season and the effects may be carried over to later years.

ROUTINE work for spring includes spraying, manuring, and thinning the crop.

Spraying

Early spring spraying is essential if the crop is to be relatively free from insect pests and diseases. As climatic conditions and types of fruit grown vary from one end of New Zealand to the other so do recommended spray programmes vary from district to district. The work of spraying is not pleasant, but the grower should apply all the sprays which have proved necessary for his district.

At each office of the Department of Agriculture where a Horticultural Instructor is stationed spray programmes suitable for that particular district are stocked and can be obtained free.

Most of the spray materials used are mainly preventive and are not very good eradicants. For this reason to prevent the entry of diseases and pests before they become evident on the trees it is necessary to aim to apply the sprays strictly according to the programme set out.

Spray materials may be divided into 2 main groups: Fungicides for the control of fungous diseases and insecticides for the control of insect pests. In general fungicides have little or no effect on insect pests and vice versa, so that most of the sprays used during the growing season are combinations of an insecticide and a fungicide.

Fungous diseases are most prevalent in the cooler, damper weather of early spring, and become less troublesome during the hot, dry weather in summer. For this reason fungicidal sprays are applied at relatively strong concentrations and at shorter intervals in spring.

Insect pests generally are more destructive in the warmer weather and insecticides are not used until the first flights of the adults are evident in late spring.

HEADING PHOTOGRAPH: Prolific blossoming on pears indicative of successful pruning.

Two of the most commonly used fungicides and the diseases they control are given on page 127.

Insecticides may be divided into 2 groups, those that kill the insect when it comes in contact with the material and those the insect must swallow and which poison through the digestive tract.

Insects which have biting mouthparts and bite the leaf or fruit may be killed by the use of the stomach poisons which normally have a fairly long residual period on the tree. They may also, under certain circumstances, be killed by the contact insecticides, but generally a stomach poison is more effective.

Stomach poisons, which include arsenate of lead and D.D.T., are used to control chewing insects such as leaf roller caterpillars, codling moth, cherry slug, and raspberry bud moth. D.D.T. also has properties as a contact insecticide against some insects.

Contact insecticides, which include nicotine sulphate, H.E.T.P., and pyrethrum, are used in the control of aphides, thrips, red spiders, etc.

Application of Sprays

Many different types of pumps may be used for spraying, the main requirement being that when the equipment is fitted with a suitable nozzle it will deliver a fine mist-like spray with enough force so that the

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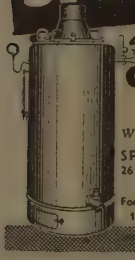

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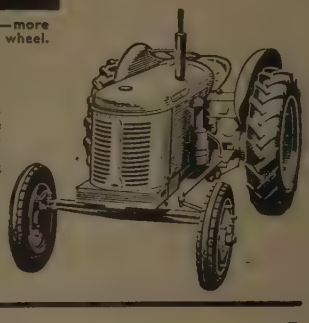

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whole tree—leaves, fruit, and shoots—may be completely covered with the spray material.

Coarse sprays consisting of large droplets do not readily give complete coverage and waste spray materials.

All sprays should be applied as soon as possible after they are mixed, as reactions between various materials in the mixture may, if left to stand, render the spray ineffective or damaging to the plants.

Regular mixing (preferably constant stirring) during the application is essential to prevent settling of the spray materials, resulting in varying concentrations being applied.

The pump and spray containers should be kept clean by thorough washing out after use.

As many of the spray materials used are toxic to animals, the materials should be kept in a safe place out of reach of children and animals.

Cultivation

Where clean cultivation is practised the cover crop or weed growth should be dug in at least a month before the trees begin growth, for while the vegetation is being decomposed by the soil organisms a temporary nitrogen deficiency may occur and if this coincides with the flowering period, a poor setting of fruit may result.

As well as this nitrogen starvation, cultivation near the flowering period tends to assist the spread of some fungous diseases which overwinter on plant material in or on the soil.

If the ground has not been dug early enough, it would be advisable to leave it untouched until about a fortnight after petal fall.

Good growing conditions for most home gardeners would be provided by the sowing down of the area in fruit trees with clover or clover and grass mixture and mowing this with a lawnmower as required. A circle or square about 6ft. across should be kept dug round each tree. Grass clippings from the lawn may be applied as a mulch to this dug area to conserve moisture and prevent weed growth. The lawnmower should not be fitted with a grass catcher when cutting the area between the trees, the clippings being left where they fall. This will build up the humus content and maintain or improve soil structure.

Manuring

The manurial requirements of fruit trees vary according to the soil type, climate, and size and condition of the trees. Animal manures if properly prepared may provide most of the plant food necessary for fruit trees, light additional dressings of potash usually being necessary. Animal manures can be used at about 3 to 4½lb. per square yard annually. The addition of small quantities of lime is necessary to counteract acidity induced by the use of animal manures, particularly fowl manure.

The application of lime, usually in the form of ground limestone, is necessary in many soils and is normally applied in winter. As well as reducing acidity it makes other elements more readily available to the plant and provides calcium, which is essential to plants. If it is used too liberally, deficiency symptoms may become evident due to trace elements being made unavailable to the plants.

An approximate annual dressing of lime would be from 3oz. to 4oz. per square yard. Usually greater quantities have to be applied to heavy clay soils than to light sandy ones.

[*Sparrow*

Spraying for the control of pests and diseases is a major operation in fruit tree culture, and adherence to a strict time schedule and the thorough application of sprays with efficient equipment are essential to success.

Where chemical fertilisers are to be used the following is a typical manurial programme:—

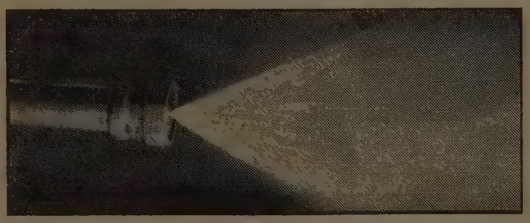
Apples, pears, apricots, and berry fruits: Sulphate of ammonia, 1 part by weight, superphosphate, 2 parts by weight, blood and bone, 2 parts by weight, and sulphate of potash, 1 part by weight.

Peaches, plums, citrus, and subtropicals: Sulphate of ammonia, 1½ parts by weight, superphosphate, 1½ parts by weight, blood and bone, 2 parts by weight, and sulphate of potash, 1 part by weight.

These mixtures should be applied in early spring as soon as growth begins and the mixture should be spread as soon as it is mixed. The quantities required per tree vary according to the size, age, and vigour of the tree,

SOME DISEASES CONTROLLED BY SPECIFIC FUNGICIDES

Bordeaux mixture (copper sulphate and hydrated lime)	Apple	Black spot
	Peach, nectarine	Brown rot, leaf curl
	Pear	Black spot
	Plum	Bladder plum
	Quince	Fabraea scald
	Apricot	Leaf curl, brown rot
	Raspberry	Leaf spot, cane wilt
	Currant	Leaf spot
	Gooseberry	Leaf spot
	Strawberry	Leaf spot
	Citrus	Verrucosis
Lime sulphur	Apple	Black spot, mildew
	Peach	Rust, brown rot
	Pear	Black spot
	Raspberry	Rust
	Gooseberry	Mildew



[*Green and Hahn*

One-angle nozzle, showing direction of spray.

R. W. Orr

Upper left and right—Duff's Early Jewel plum before and after thinning. Lower left and right—Gravenstein apple before and after thinning.

and the soil types. From 6lb. to 15lb. per standard fruit tree should be applied, and from 1lb. to 3lb. per berry fruit bush. Less manure should be used on a tree that is growing strongly than on one where growth has slowed down. Fruit trees will continue to crop well only if they are producing some young growth each year.

Fruit Thinning

The object in fruit thinning is to encourage the tree to produce each year good crops of medium sized, good quality fruits. If fruit set is heavy and no thinning is done, the mature fruit may be small and of poor quality, and an extremely heavy crop one year, if left unthinned, may cause a very light crop the following year, as the fruit buds may not be fully developed.

Crowded fruit also makes disease control more difficult.

Thinning consists of spacing the fruitlets on the branches so that there remain enough to produce a good crop of fruit, if they develop to a fair size. This is a matter of experience and as a general guide apples and pears should be thinned, leaving 2 or 3 fruits per cluster where a light crop is showing and reducing the clusters to singles where a heavy crop is showing.

Stone fruits should be thinned to single fruits spaced from 4in. to 6in. apart.

Thinning should be done as soon as the fruitlets are large enough to handle (about the size of a marble), so that the fruits left on the tree will each receive as much as possible of the food supply.

Grafting

Scion wood for grafting should have been collected and partially buried in the soil during the dormant period.

Grafting is done after growth has begun, but usually before flowering, as the sap flow at this period appears most conducive to good unions. By grafting it is possible to change the variety of an established tree to a more desirable one. It also enables the home gardener to produce two or more varieties on one tree, which is an advantage where space is limited.

Frost

Little can be done in the home orchard to control frost, but the covering of berry fruits, Meyer lemons, and dwarf trees with scrim or paper on frosty nights can help to reduce the frost damage to these fruit trees.

At blossoming it is possible to assess the success or failure of the method of pruning. If pruning is satisfactory, a good supply of blossom is produced each year; if it is too severe, little or no blossom is produced, and if it is not severe enough, the tree tends to produce heavy blossoming one year and very little the next year.

Bulletin No. 340 "Soil Fertility in the Home Garden" is available free at the nearest office of the Department of Agriculture.

Buttercup Control with Chemical Weedkillers

FARMERS often wait until the buttercup flowers before they decide to spray. This is a very unsatisfactory procedure, since much of the advantage to be obtained from spraying is already lost. The buttercup has already had a severe smothering effect on the pasture which could have been avoided by earlier spraying. The correct time to spray is not as much a question of time as stage of growth. Spraying is best done when the buttercup plants start to lift when active pasture growth begins, usually about the middle of September. If spraying is carried out too early—June, for example—plants germinating later in spring will not be eradicated. Spraying at the correct time is associated with minimum depression of the clover. Late spraying can, however, be followed immediately by droughty weather, as it was last season, and the clover recovery under these circumstances can be very poor.

For all species of buttercup except giant ¼lb. of 2,4-D per acre gives a complete satisfactory kill. In those areas where the giant species is a problem M.C.P. should be used in place of the 2,4-D and should be applied at the rate of up to 2lb. of acid equivalent per acre. Where the plants are large the water should be increased up to 25 gallons per acre to ensure a good cover.

—*G. L. BANFIELD,*
Instructor in Agriculture,
Department of Agriculture,
Thames

Honey House Plant for Handling Manuka Honey

HONEY produced from manuka (*Leptospermum scoparium*), or tea tree, has properties not generally found in other honeys. Though colour, flavour, and consistency may vary widely, depending on the locality from which the nectar is gathered, the bulk of the crop from this source presents many difficulties to beekeepers in extraction, straining, and conditioning. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, and D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, outline plant and methods of operation which will enable beekeepers in manuka areas to obtain the maximum extraction and to produce this honey in its most attractive and saleable form.

MANUKA honey as stored by the bees is usually a light amber and has a distinctive flavour. A condition peculiar to this honey is its thixotropicity or jelly-like consistency. It is this condition and the susceptibility of the honey to damage from heat which are responsible for the difficulties experienced by many beekeepers in extracting, straining, and packing manuka honey. It is reputed to be similar in these respects and that of flavour to the much publicised heather honey of England and Scotland. Colour, flavour, and consistency, however, may vary within fairly wide limits, depending on the location from which the nectar is gathered. Experience over the years has shown that plant and technique can be developed to extract and process this type of honey satisfactorily. By using approved equipment and the proper technique many beekeepers are finding that they are now able to extract manuka honey cleanly from the combs, obtaining in some instances well over 35lb. per super.

Equipment Required

The plant and equipment required are as follows:—

Hot Room

Manuka honey can at times be extracted in the ordinary way immediately after it is removed from the hives, but a considerable amount will always remain in the combs and it is doubtful whether the quantity secured justifies all the labour that goes into extracting. To enable the maximum amount to be removed from the combs by ordinary extraction methods pre-heating of the honey for approximately 12 to 24 hours is recommended. This is done by warming the honey to a temperature of approximately 90 to 95 degrees F. in a hot room. Care has to be taken not to allow the temperature to exceed 95 degrees, as otherwise the wax combs are likely to break down.

The hot room is essentially a closed compartment properly insulated with one or two layers of wallboard. This is generally sufficient to maintain the heat at the required temperature. A ½ h.p. electric motor and suitable fan circulate the air over a 2000 watt electric element. The motor and element are controlled by a thermostat. When the temperature is raised to the required 90 to 95 degrees the unit cuts out and does not come in again until the temperature begins to drop. Once the room is warmed up the unit generally runs for 5 to 10 minutes and then cuts off for 20 to 30 minutes, depending on the efficiency of the insulation.

The hot room should not be larger than required by the individual beekeeper. The plan of honey house layout on page 130 gives a size for 80 to 90 supers. The supers should be placed in the hot room as soon as possible after removal from the hives and before the honey cools. Drip trays are essential and supers should be placed in the room so that each pile has several inches of air space around it. This allows free circulation of warm air around the supers. Some beekeepers find that the staggering of each super in a pile is an improvement.

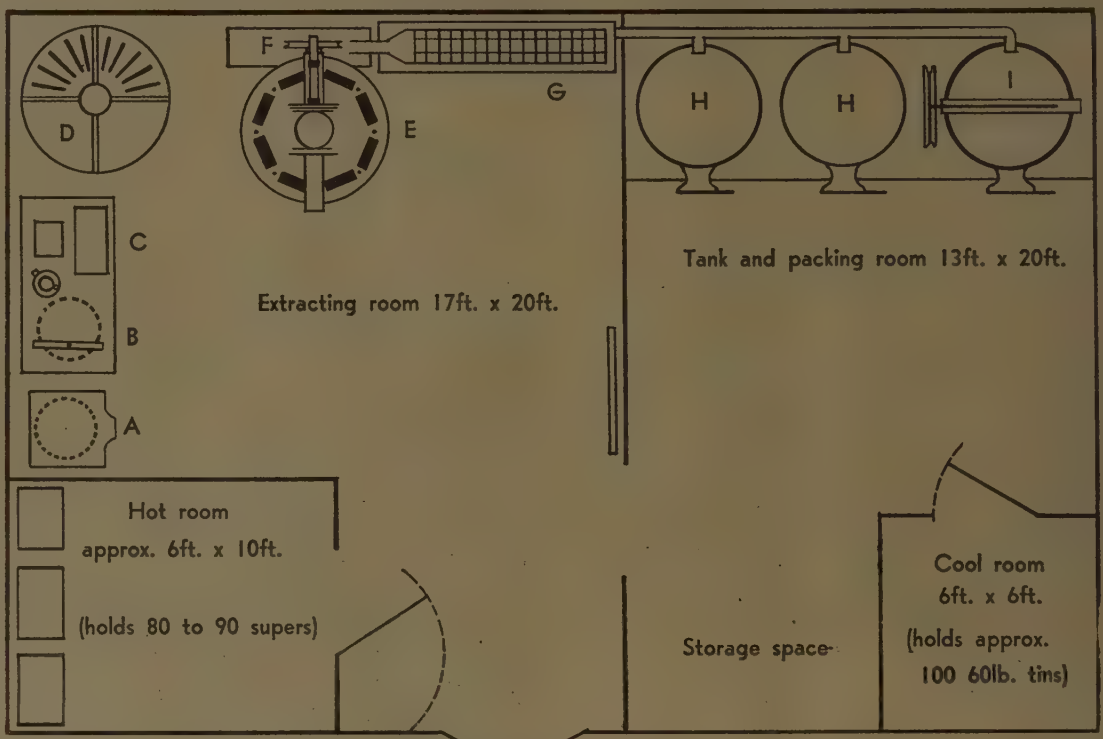
Experimental work carried out recently has shown that a limited degree of drying can be effected in hot rooms provided some fresh air is allowed into the compartment. This can be done by making a small opening (about 3in. x 3in.) near the floor on the wall nearest the heating unit. This opening can be fitted with a slide to allow control of fresh air going into the hot room. A similar opening and slide should be made near the top of the wall opposite the heating unit as an outlet.

The admission of fresh air will require the heating unit to run longer; also the humidity of the introduced air will govern the amount of drying effected in the hot room.

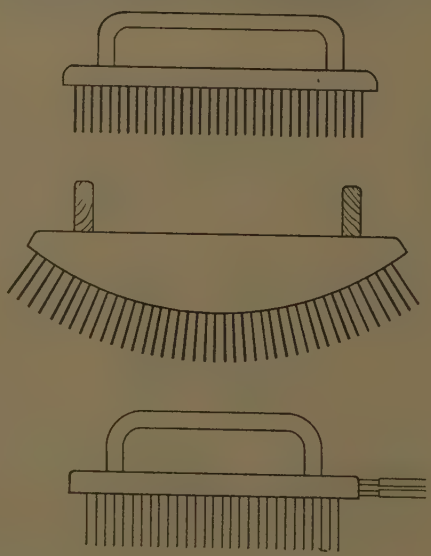
Uncapping

Uncapping is carried out in the usual manner with either the steam-heated knife or the Rosedale plane. The honey taken off with the cappings has then to be disposed of. The general practice with other honeys is to apply extra heat to encourage the rapid separation of the honey from the wax. This method cannot be used with manuka honey, as the application of additional heat is likely to cause serious deterioration of flavour. Pressure has therefore been found to give the most satisfactory results in securing the maximum amount from the cappings. The following is a description of the cappings press recommended for manuka honey:—

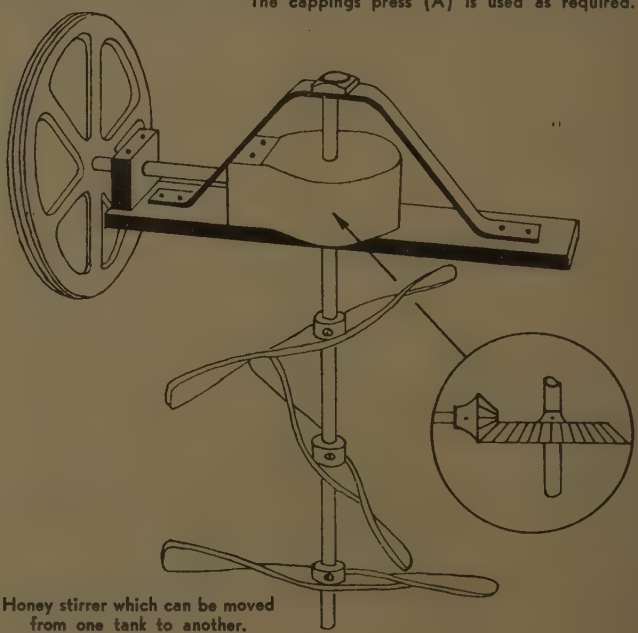
The press is built on very similar lines to the well-known hatch wax press, but the cylinder of wooden strips is not held together by a metal container but by two narrow metal bands which can be unscrewed when the pressed cake of wax is to be released. These wooden containers stand in trays about 6in. deep. Immediately the container is filled with cappings, pressure is applied by a powerful jack, or a continual pressure can be exerted by a long weighted arm. Two or three of these wooden containers are required so that while one is being pressed the others can be filled up with cappings. The operator should always endeavour to



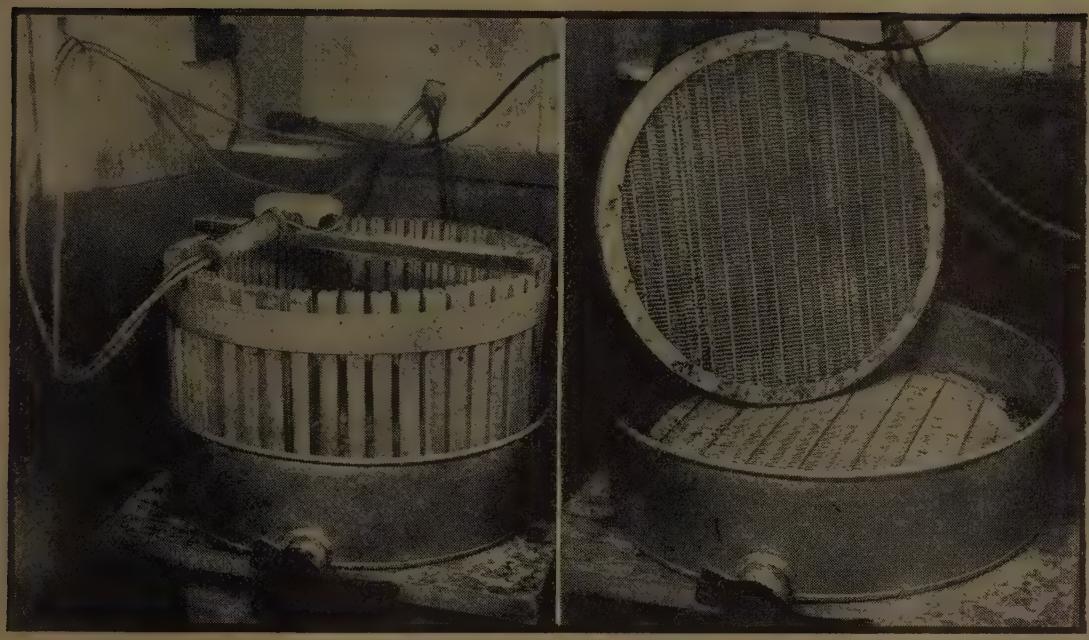
Plan of honey house with equipment for handling manuka honey. A—Cappings press. B—Uncapping unit. C—Pricker pad. D—Circular comb holder. E—8-frame extractor. F—Pump unit (motor at left). G—Cylindrical strainer. H—Storage tanks. I—Movable honey stirrer. The method of working is from the hot room through B, C, D, E, F, G, H, and I to the cool room. The cappings press (A) is used as required.



Types of pricker pads. Upper—Flat type. Middle—Rocking type, which covers the comb in one operation. Lower—Steam-heated type, which can go right through the comb.



Honey stirrer which can be moved from one tank to another.



Left—Uncapping press, showing basket and tray. Right—Holding tray with top and bottom grids.

press while the cappings are still warm. The general construction and set-up of this type of press are shown in the illustrations above and at bottom left on page 133.

Pricker Pad

The extractor will not remove manuka honey satisfactorily unless the combs are first subjected to the effects of what is usually called the pricker pad. This implement breaks up the jelly-like consistency of manuka honey, thus allowing the extractor to carry out its particular work. The pricker pad is simply a holder which has numerous metal spikes on the under side. A more apt title for this piece of equipment would be "beekeeper's hedgehog", as it looks uncommonly like the back of this animal.

After the comb has been uncapped it is laid on a wood block and the spikes of the pricker pad are pushed into the honey. When one side is done the comb is reversed and the other side subjected to the same treatment. As considerable pressure is required, it has been found desirable not to make the pad too large. One that will cover a comb in four strokes appears to be a good size. There are several designs in use and a brief description of three types follows:—

Small flat type: This type of pad sometimes rests in a small tray of hot honey. This keeps the metal spikes warm and reduces the effort required in pressing the pad into the comb.

Rocker type: This was designed to cover a larger area of comb at one time and also to reduce the suction effects on the spikes when the pad is being withdrawn.

Both the small flat type and the rocker type give quite satisfactory service but tend to damage the combs. Beekeepers operating in manuka areas will have to make fairly heavy replacements of combs each year or keep the worst of them above excluders.

Steam-heated pad: In an effort to prolong the life of combs several beekeepers are using the steam-heated pad with very thin spikes. The slender spikes, aided by the heat from the steam jacket, easily go down into the honey and can be pushed right through the midrib of the comb, thus eliminating the necessity to do the other side. Combs may last longer when this type of pad is used, but it is not satisfactory on old, tough combs, as the spikes are too light to pierce the hard centres.

Extractor

The full reversible basket type honey extractor is the most satisfactory for dealing with manuka honey, as the combs need to be rotated at the maximum speed consistent with safety from damage and require the support of good, sound baskets. It is also an advantage to pay particular attention to the wiring when the frames are first being assembled and to make sure that the wire is tight and well tacked to the frame. Four wires instead of the usual three are a decided advantage in helping to keep the comb in one piece. Use of a radial machine with this type of honey entails the risk of losing most of the combs. A semi-radial appears to give better results, but is still not as suitable as the common basket machine for extracting manuka honey.

Pump

A type of pump specially suited for pumping honey should be used. Though the cheaper cog pump will pump honey, it is not completely satisfactory. Manuka honey generally contains a considerable number of wax particles and air bubbles after extraction because of the action of the pricker pad. The wax becomes broken up into tiny particles when crushed between the cogs in the cog type of pump. Also the cogs appear to aerate the honey to a much greater extent

For Reference

MOST of the equipment mentioned in this article has already been fully described in the "Journal" at various times. Fuller details on particular items may be found in the following issues:—

Cylindrical honey strainer, April 1951, p. 335.

Honey pump unit, April 1950, p. 341.

Hot-room heating unit, October 1950, p. 315.

Mechanical stirrer, May 1950, p. 435.

Steam-heated pricker pad, November 1950, p. 421.

Uncapping press for manuka honey, June 1951, p. 482.

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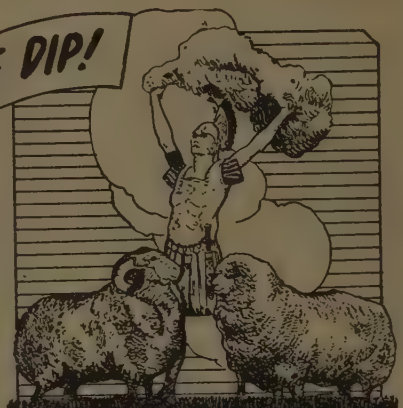

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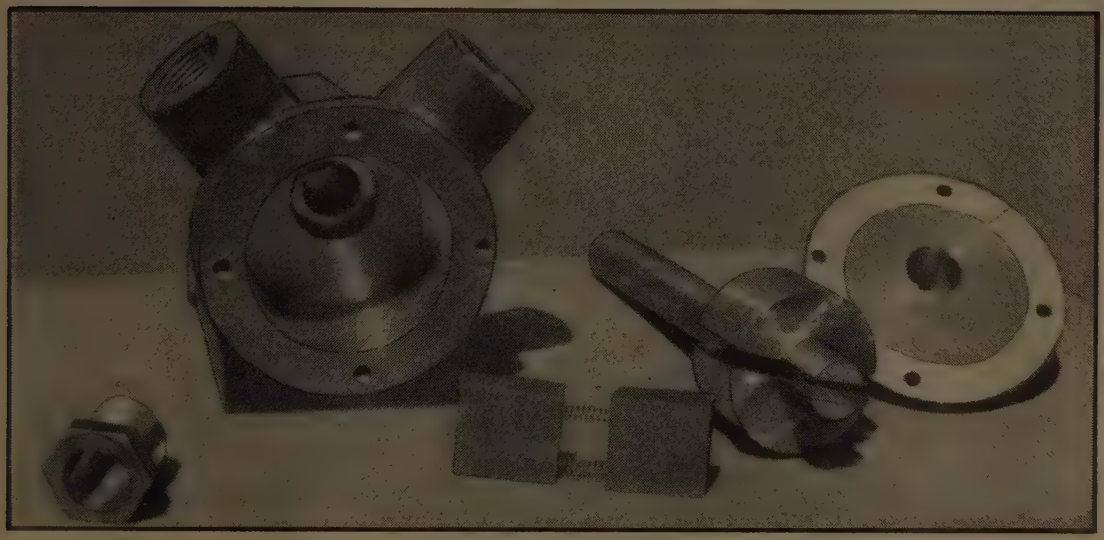


Type of pump especially suited for pumping honey.

than does the proper sliding vane type honey pump.

Strainer

In the past one of the greatest difficulties encountered by the beekeeper in handling manuka honey was the straining. This was a problem because of the jelly-like nature of the honey and the excessive amount of wax particles. Ordinary strainers which worked quite efficiently with the usual types of honey were found unsatisfactory for manuka. Endeavours were made to short-circuit straining to a certain extent by leaving the honey in settling tanks in warm insulated tank rooms and skimming it.

However, Mr. G. B. Sharp, of Matakana, Northland, appears to have solved the problem of straining manuka honey by devising a special type of cylindrical strainer. Several are now in use and giving most satisfactory results. The capacity of the strainer is such that it will deal with all the honey that a beekeeper can extract in one day. Its success is attributable to the large straining area provided and in the method of use.

The strainer is cylindrical and 4ft. long by 1ft. in diameter, providing a straining surface of approximately 12 sq. ft. The strainer is supported on two cradles, which rest in a tinned steel tray 5ft. long, 1½ft. wide, and 3in. deep. The tray and strainers are given sufficient inclination to cause a fall of 3in. in the total length. It is used as follows:—

Honey is pumped from the extractor into the open end of the strainer, where it flows through the mesh into the tray. As soon as one portion of the strainer becomes blocked, the strainer is given a portion of a turn to bring a fresh section of gauze into use. Once the whole surface has been used and a considerable amount of wax particles have collected the cylinder is given a quick half turn. This has the effect of bringing the rubbish to the top of the straining cylinder, when its own weight breaks it loose from the surface. It does not obstruct further free straining for some time. A full description of this strainer can be found in the April 1951 issue of the "Journal".

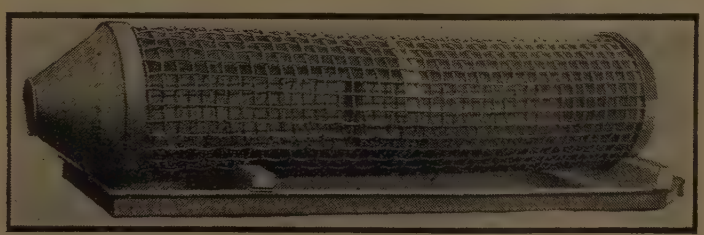
Storage Tanks

The honey from the cylindrical strainer is run direct into the settling or storage tanks. These should be in a suitable handy room that is well lined so that the honey will be stored under the driest possible conditions. Owing to the nature of manuka honey very little is to be gained by leaving the honey in the settling tank for any odd particle to rise to the surface. It is much better to begin packing as soon as possible.

Mechanical Stirrer

To prepare manuka honey for marketing in its most attractive condition some processing of the honey will be required. This should be anticipated by the beekeeper and he

Applying pressure to cappings by a jack. A long weighted arm can also be used.



Cylindrical strainer. Honey enters at the cone-shaped end.

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should have a supply of good, smooth-grained starter honey on hand. Though 5 per cent. of starter is perhaps sufficient for normal New Zealand honey, it is best to use a little more than this for manuka honey to get it to granulate as quickly as possible. The speed of granulation governs the quality of the grain.

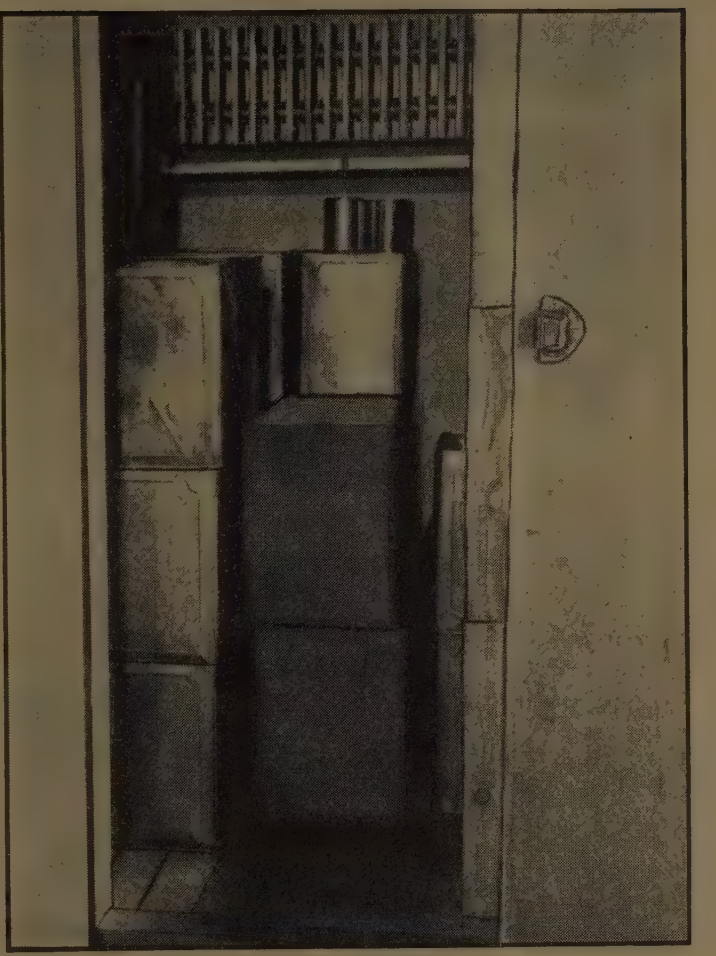
As the stirring of this amount of honey into the heavy-bodied manuka honey by hand is rather laborious, mechanical means should be adopted. A honey stirrer is shown in the bottom right diagram on page 130. This type can be moved from tank to tank. It is necessary to see that the stirring blades are firmly fixed to the centre spindle. This is done by set screws if the blades are of metal or by pinning the blades to the shaft if wood is used. The starter honey should be thoroughly incorporated before filling into 60lb. tins is begun. One or two hours of stirring will be ample. By this method it will be possible to have the honey tinned the day after extraction. Working on these lines reduces the number of storage tanks and the size of the tank room required.

Cool Room

The extraction of manuka honey generally takes place during the warmest part of the season and when there are very few cool nights. Warm temperatures retard the quick granulation of honey, and rapid settling of the honey is required if a smooth texture is to be attained. To secure temperatures most suitable during the warmer periods refrigeration is necessary. Cool rooms of the smallest capacity consistent with the quantity of honey being handled are not difficult to construct, the most expensive item being the refrigerating unit.

The handling of manuka honey in 60lb. tins gives the beekeeper the opportunity of making full use of the smallest refrigeration unit. In a room of approximately 6ft. x 6ft. x 6ft. 6in. high well over 100 60lb. tins of honey can be cooled at one time if necessary. Cool rooms are generally constructed within the existing honey house in some suitable corner. The inside of the walls, ceiling, and floor should be first covered with light tarred roofing material, care being taken to make sure that all joins are completely sealed. This ensures an impervious moisture barrier to the outside air. The insulation material is then put on and can consist of slabs of 2in. cork or several layers of softboard. If the latter is used, small air spaces between each sheet must be allowed for by means of thin slats of wood. The insulation on the floor can be covered with flooring boards so as to give a firm surface for stacking the honey. The sides and ceiling, if cork has been used, can be covered with hardboard sheets and painted a light colour.

A ½ h.p. refrigeration unit will be required and should be installed by a refrigeration engineer. A temperature of only 50 to 57 degrees F. is required and the well-stirred honey after being in this cool room for 5 to 10 days will have set firm and be in good condition for marketing. It is unfortunate that this expense is necessary when the unit will be in use for only a few weeks throughout the year. However, some beekeepers may be able to avoid this outlay if they happen to be handy to an industry which uses cool storage and is prepared to allow the beekeeper to make use of it for a nominal charge.



Cool room containing 60lb. tins of honey.

Sequence of Handling

The following procedure has to be carried out with the equipment described:—

1. Capped combs are placed in the comb warming room for about 12 to 24 hours. Temperature is controlled at 90 to 95 degrees F.

2. Combs are uncapped by the usual method. Cappings should be pressed immediately to take advantage of the heat that is in the honey from the warming room.

3. Combs are pricked. If the special steam-heated pricker is used, this goes right through the midribs into the cells on the under sides of the combs. This eliminates the need of reversing the combs and prevents much of the damage to combs that occurs when the other types are used.

4. Honey is extracted in the usual way, perhaps with the extractor running a little faster than is usual for ordinary honey.

5. Honey is pumped up through a cylindrical honey strainer. The strainer is given a turn round in its cradle at frequent intervals. Experience will tell how often.

6. Honey goes into the storage tank; make sure that it runs down on the side to prevent undue aeration. Keep a tight-fitting lid on the tank during all times that honey is in it.

7. Next day the required amount of starter honey is stirred in, preferably by mechanical means. Continue stirring until incorporation of the starter is complete. The time will depend on how quickly the honey appears to thicken up.

8. Containers are filled and immediately placed in the cool room (approximately 54 degrees F.) and left there until the honey has set.

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Choice of Breed of Fowl for Household Poultry Keeping

ONE of the first questions to be decided by the prospective household poultry keeper before buying in stock is the breed of fowl required. Strains within a breed vary and because of this it is important to obtain stock from a reputable breeder. In this article H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, discusses the suitability of different breeds of poultry for the household poultry keeper and emphasises the need of obtaining a good strain.

THOUGH there are a great many breeds of poultry in New Zealand, not all are available to household poultry keepers. Such breeds as the Silver Wyandotte, Buff Orpington, Black Minorca, and White Plymouth Rock will have little appeal for the householder. These handsome birds have never been developed on utility lines in New Zealand and are today found only on the show bench in rapidly decreasing numbers.

It is rather strange and decidedly unfortunate that only two or perhaps three commercial breeds are available to poultry keepers in New Zealand today. In the United Kingdom five or six breeds are well represented in laying trials, but in this country White Leghorns and Australorps are recognised as the leading or indeed the only commercial breeds. Rhode Island Reds have never reached the popularity here that they enjoy in Britain and the United States and cannot as yet rival the other two breeds.

White Leghorn

The White Leghorn is still the most popular breed in New Zealand and is a good utility breed. The ability of these fowls to lay plenty of large, white eggs plus their non-broodiness is ample recommendation for any household poultry keeper. In laying trials in recent years at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, White Leghorns have been rather disappointing, but this can largely be attributed to loss of production from moulting caused by the change of environment and also through breeders' forwarding pullets which have been laying for some time before the trial begins.

Leghorns are a nervous breed and any sudden change of conditions or feeding will cause a partial or complete moult. This will, of course, result in their being out of production for 6 to 10 weeks, during which such breeds as the Australorp and Rhode Island Red will have established a commanding lead.

[*Niederer*

This Crossbred fowl is the progeny of an Australorp male and White Leghorn female.

Australorp

The numbers of Australorps have increased rapidly in the last 10 years in many parts of New Zealand. In Hawkes Bay, for instance, the flocks on only a few commercial farms are not at least 50 per cent. of Australorps, and several large establishments rely solely on this breed for egg production.

The Australorp is a particularly docile bird and can be recommended to household poultry keepers desiring a breed which will give good results during winter and can be housed equally well on the intensive or semi-intensive system. In addition to its production ability this breed has proved itself more resistant to leucosis or fowl paralysis than most others and this consideration alone should influence the choice not only of prospective poultry keepers but of those who have experienced heavy losses from this disease.

Australorps are the only serious competitors to Leghorns for popularity in New Zealand.

Crossbreds

The crossbred fowl is another "breed" which has gained in popularity in recent years. The Leghorn-Australorp or Leghorn-Rhode Island Red cross is an excellent producer of large, tinted eggs, and the body-weight makes it an excellent table bird for the average family. The White Leghorn male mated to Black Australorp females will leave progeny with almost pure white plumage and with pale leg colour without trace of yellow or black pigment. The reverse cross will give much more black feathering and black leg colour.

The White Leghorn is still the most popular breed in New Zealand.

Either cross is an excellent producer, but most poultry keepers agree that using the light breed male gives a lower predominance of broodiness than the reverse cross.

Alternative Breeds

The fact that most commercial poultry farms run White Leghorns or Australorps does not mean that these are the only breeds worth considering. Anconas, for instance, are good layers, and Legbars and White Wyandottes can be quite profitable for household poultry keeping. The difficulty lies in procuring suitable stock, for the breeders of these breeds are few with a small number of breeding stock.

Factors Affecting Choice

A householder is more likely to make a success of poultry keeping if he admires the breed he keeps. If the breed kept is not completely to the owner's liking, he should quit it and acquire another which suits his taste. The greater the degree of pride in the birds the greater is the likelihood of success with poultry keeping. The fact that one breed lays fewer eggs than another may be more than compensated for by the fact that the former breed is far more attractive and docile and perhaps less broody.

When to Buy Chicks

An important point often overlooked is the most suitable time to purchase chickens. Generally August and September are the most popular months for this purpose, but many favour late July, particularly for heavy breeds.

Australorps or Crossbreds hatched the second week in August will usually prove very satisfactory, but Leghorns and other light breeds can be hatched 2 or 3 weeks later. Early hatched pullets rear well and mature more quickly than the late hatched bird. They are, however, more likely to go through a partial moult during April and May which will be avoided in pullets hatched in September.

Whichever date is selected, it is the strain within the breed that counts. Chickens should be bought only from a reputable breeder and particularly from blood-tested stock. If this is done, financial loss and disappointment will be avoided later.

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Increasing Carrying Capacity on Wairarapa Hill Country

THERE are considerable areas of manuka-covered hill country in the Wairarapa where production can be increased by the use of modern equipment in clearing and cultivating the land. In this article F. G. Spite, Instructor in Agriculture, Department of Agriculture, Masterton, describes briefly the methods being used by a farmer in the north Wairarapa to develop this class of country.

"BRANCEPETH", the property of Messrs. R. and H. Beetham, comprises 3000 acres divided into two main classes of land: 2000 acres of good hill country originally covered in heavy bush, the soil being derived mainly from mudstone, and 1000 acres of rolling to steep sandstone country.

The block of 1000 acres, except for light bush in the gullies and some patches of native grasses, was covered with fern. In the past the area was burnt, but after each successive burn the invasion of scrub became more rapid, and though continual scrub cutting was the practice until the Second World War, by 1945 the whole area had largely reverted to manuka from 3ft. to 10ft. high.

Improvement Programme

In 1945 a systematic programme of development was begun, the first stage being the subdivision of the 1000-acre block into paddocks of from 30 to 80 acres. The programme provided for 50 to 60 acres of new ground to be broken up each year, but from this autumn the plan has been amended to include 100 acres which are being giant disced, and it is hoped to complete the development of the 1000 acres during the next 4 years.

Where possible a 2-furrow, semi-swamp plough is used to break up the land to a depth of 9in. to 12in. in early autumn, and taller scrub may be handled with a bulldozer or single-furrow swamp plough. On the steeper slopes giant discs are necessary for the initial cultivation. After a winter fallow the ploughed ground is worked with tandem discs and harrows and sown to a winter feed crop of chou moellier and swedes in October or November.

The winter crop is followed by rape for summer fattening and the area is sown to pasture in March. On steeper and poorer paddocks crops are not grown and the ground is left fallow with occasional discings for 12 months or even 2 years, and is then sown to pasture not later than the middle of March. Up to the present 700 acres have been sown to new pasture and feed crops.

Other Development Work

In addition to ploughing, giant discing, and preparatory cultivation work, other development work comprises mole and tile draining, bulldozing for dams and access tracks, and the erection of concrete culverts and fences. All of the work, with the exception of some dragline draining, has been done with the farmers' own equipment.

Fertilisers and Pasture Mixture

Each crop is sown with a mixture of 3cwt. of superphosphate and blood and bone manure per acre, and a dressing of 30cwt. of lime is applied before the pasture is sown. Subsequent treatment consists of a dressing of 3cwt. of superphosphate and a further 30cwt. of lime on the 1-year-old grass paddocks, and thereafter the area is topdressed with 2cwt. of superphosphate each autumn. A further ton of lime is applied in the fourth year. Seeding rates are heavy, as it is believed that on this poor land a quick cover of grass and clover is necessary for good establishment so that heavy stocking with sheep is possible in the first spring to obtain animal manure

HEADING PHOTOGRAPH: Mob stocking on newly developed country on "Brancepeth". The location of the farm is indicated by the cross on the map.

and raise the fertility. A typical pasture mixture sown on the farm comprises:—

	lb.
Certified Mother perennial ryegrass	30
Certified short-rotation ryegrass	10
Mt. Barker subterranean clover	2
Tallarook subterranean clover	2
Mother white clover	3½
Cowgrass	6
Timothy	1
	54½

Grazing Management

After an autumn sowing the paddock is kept free from stock until spring growth begins. When the ground is sufficiently dry in August and September large mobs (1000 to 1500) of hoggets are on and off grazed on the paddock. Later in the spring light cattle are introduced to control the growth, but no heavy cattle are used until the land is consolidated.

Production Increases

As the 1000-acre block which is being developed is run in conjunction with 2000 acres of good hill country, separate stock figures cannot be given. However, it can be assumed that the increase in stock numbers is mainly due to the establishment of first-class pastures on the 1000-acre block where manuka was once the dominant cover.

SHEEP NUMBERS

Year	Ewes	Total sheep
1944-45 ..	3,000	4,060
1946-47 ..	3,000	5,660
1948-49 ..	3,025	5,910
1950-51 ..	3,025	5,959
1952-53 ..	3,500	7,300
1953-54 ..	3,700	6,810

In the 1946-47 season 1099 lambs were fattened and in the 1953-54 season 1200 were fattened.

Increase in Cattle

Cattle numbers have also increased. In 1947, 425 cattle, including 178 breeding cows, were wintered, and this season 207 cows were run with the bull and a total of 499 cattle are being wintered. It is expected that it will not be long before 60 to 80 bullocks are fattened on the improved country. As increased areas are improved it is becoming a problem to winter sufficient cattle to control the spring flush, and the making of silage may be the answer to providing fodder to bridge the gap in seasonal production.

The results so far achieved on this property are a guide to the productive potential of similar scrub-covered Wairarapa hill country, of which there are considerable areas.

Gravel Pit Used for Silage Trench

WITH the appearance of the forage harvester and the buckrake in recent times there has been a revival of interest in Canterbury in the making of silage for both cattle and sheep. Many Canterbury farmers have already made good progress in the new techniques of silage making, and there are many disused gravel pits throughout Canterbury which would make excellent sites for silage trenches. The advantages of such a situation as shown in the illustration above of a silage pit at Darfield, Canterbury, are that the load can be easily dropped on the site, the silage is easy to feed out, and there is free drainage.

For these reasons such pits are ideal for use with a forage harvester or buckrake in making good-quality silage with the least amount of waste. In the trench shown the forage harvester unloaded the material from the top, but the silage would be fed out easily from the approaches at the ends. The saving in labour represented by the modern methods of making silage and feeding out should allow ensiling to supplement, and to some extent to supplant, haymaking, particularly for the conservation of surplus grass and lucerne growth such as occurred in the 1952-53 season in Canterbury.

—P. R. BARRER, Instructor in Agriculture,
Department of Agriculture, Christchurch

Book Review

"Beef Cattle Husbandry": Alan Fraser

"BEEF CATTLE HUSBANDRY" is a grand little book which will have a definite appeal to New Zealand producers and others interested in beef. Alan Fraser has long been known to New Zēalanders as the author of one of the few readable books about sheep. Though he describes himself as a shepherd and apologises for entering the "bull-ring", he has certainly written an equally readable book on beef cattle. It is rare indeed that we find such a marked capacity to assess the relative contributions of science and practice to any branch of agriculture combined with sufficient journalistic skill to make the story at the same time educative and enjoyable.

Fraser begins by describing clearly the problem confronting Britain as a result of the decline in the exportable surplus of world beef and her own increased demand from her expanding population. He dismisses as wishful thinking the possibility of increasing imports, and as defeatism the idea that the people should permanently reduce their beef consumption, and plumps for increased home production as the only agreeable solution. The rest of the book is full of sound advice and illustrations as to how this can be done. Though many of the methods advocated could never be applied directly in this country, there are in every chapter much advice and many clues to better practices which could be followed up here with profit.

There is a first-class section on meat quality and grading. Six chapters on breeds and cattle types are excellently done, providing a wealth of intriguing information. Five chapters on breeding, feeding, and fattening methods are handled in a constructive and provocative manner. The final chapter on future beef policy will be challenging to the British and of more than a little interest to New Zealand policy makers.

—C. P. McM.

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Free Markets Mean

Pig Weights Will Have to be Watched

WITH the advent of free marketing overseas when the bulk-purchase agreements for meat with the United Kingdom end next month pig producers will have to watch the weights of their pigs even more carefully than previously if they wish to get the highest possible return. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with this aspect of pig production.

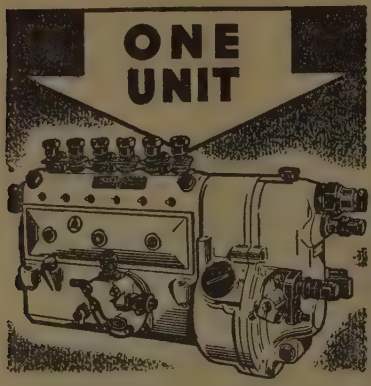
THOUGH there has been a free market for all classes of pig meats within New Zealand for some years now this has been governed to a considerable extent by the prices ruling for export under the bulk-purchase agreements between the British and New Zealand governments. What effect the termination of this contract will have on the general price level of pig meats is difficult to foresee. However, some indication can be obtained as free marketing of meat in the United Kingdom began in July. One thing is certain: The carcass in one of the unwanted weight ranges will bring a much lower price than the one that is within any of the desirable ranges.

To get the best prices for his pigs the producer will have to watch the weights carefully and adjust management so that they are turned off at the best weights. Care will also have to be taken to avoid marketing overfat pigs even at the desirable weights.

A roof over the scales and a shelf for writing up records are a great convenience.

Types of Scales

A set of scales and a weighing crate should be part of the standard equipment at the piggery so that pigs can be weighed regularly. A portable weighing crate with scales can be purchased or a weighing crate can be made on the farm and used with a spring balance or on a platform scale. The scales should be in a race located so that the pigs can be conveniently taken out of their pens, weighed, and returned with the least possible trouble and disturbance. Where the weighing race is placed will depend on the general plan of the piggery, but a pen in which each group of pigs can be held before weighing is very necessary. Having two pens with a drafting gate on the opposite side of the scales to the holding pen is a great convenience for drafting out pigs that are up to weight. A roof over the scales and weighing crate makes conditions a great deal pleasanter in bad weather and a shelf where writing-up of weight records can be done is useful. A liveweight: deadweight table should be hung on the wall beside the scales. If a maturity index (a list showing the age in days that a pig should take to reach various liveweights) is also provided, a very good idea can be gained of how pigs are fattening. The tables mentioned are only a guide to the carcass weights of pigs. Individual pigs may vary from the weights given, but a farmer soon gets to know what allowances have to be made for his



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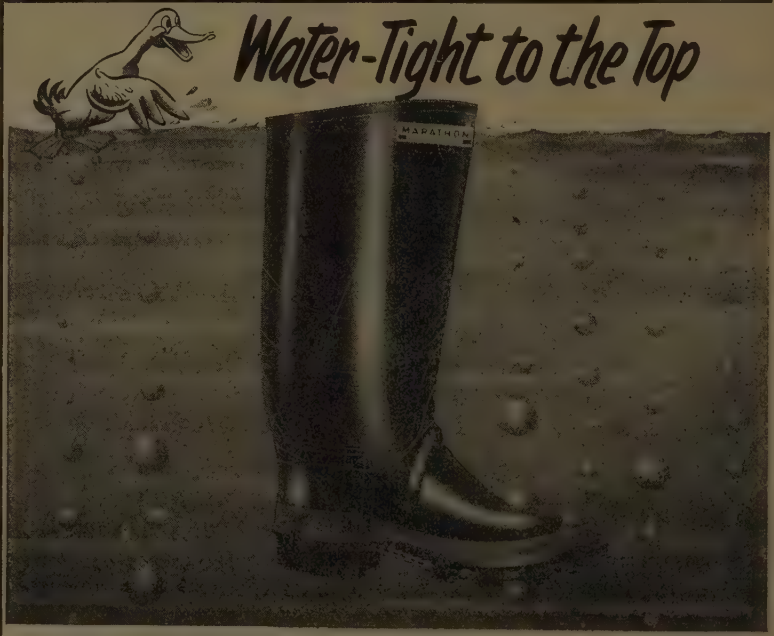

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own pigs and so is able to make full use of the tables.

If a spring balance is used, it should weigh up to 300lb. to allow sufficient margin for the weight of the pig and the crate. The disadvantage of the spring balance is that when in use the crate with the pig in it hangs from the balance and any movement of the pig causes the pointer on the scale to move and makes quick reading of the correct weight difficult. On the other hand a new spring balance costs much less than a new platform scale. The type of crate shown in the illustration at right is suspended by a long bearing running the full length of the crate and this stabilises it against the movements of the pig, thus making reading of the weight much easier.

It is, however, possible by inquiry from the local inspector of weights and measures to find second-hand platform scales that have been condemned as no longer fit for commercial use yet which are quite satisfactory, at the cost of perhaps some minor repair, for weighing pigs on a farm, where slight inaccuracy is of no consequence. Such scales can often be purchased very cheaply.

Weighing Crates

Weighing crates should be made of the lightest material that will give the necessary strength. The internal dimensions of the weighing crate should be: Length, 50in.; height, 28in.; and width, 13in. This size will easily accommodate a top-weight baconer and yet be narrow enough to prevent smaller pigs from turning round. The dimensions and method of constructing a weighing crate are shown in the diagram on page 145. A light, strong timber such as oregon pine should be used. If out in the open, weighing crates should be well painted to prevent them from becoming saturated with water in wet weather and thus much heavier. If an unpainted wooden crate is exposed to the weather, its weight must be taken every time the pigs are weighed. The best solution is to have a roof over the scales and weighing crate.

By being weighed regularly fattening pigs can be sold at the best

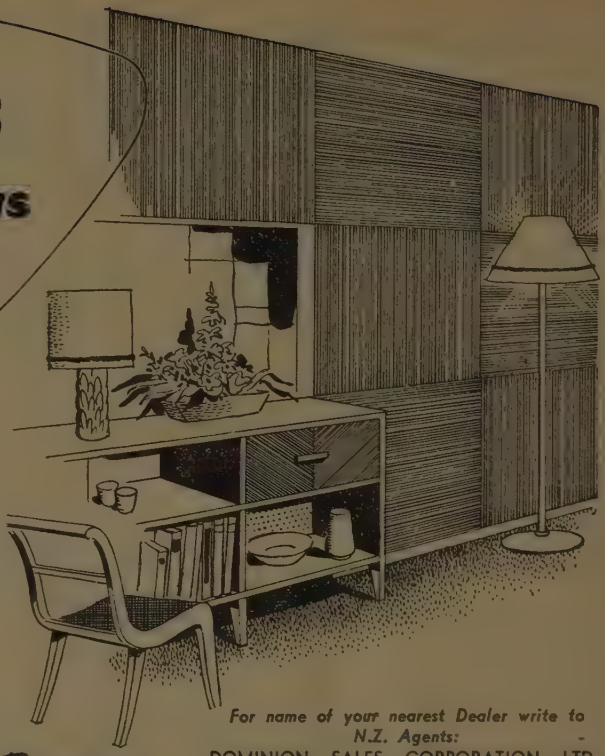
Portable weighing crate and scales.

Spring balance and crate in a race. Here the spring balance is attached to the lever at a distance from the pivot which is double that between the pivot and the point of suspension of the crate. With this method gross weights up to double the normal capacity of the scales can be recorded, as the gross weight will be twice that shown on the scales. However, a true reading will be obtained only if the hook of the spring balance is anchored so that the weighing is done with the lever horizontal.

MATURITY INDEX TABLE

Age days	Live-weight	Per cent. carcass	Carcass weight	Age days	Live-weight	Per cent. carcass	Carcass weight
	lb.		lb.		lb.		lb.
	60		40	156	142.5		99.3
	61			157	143.8		100.3
	62			158	145.1		101.3
	63		42	159	146.4		102.3
	64			160	147.7		103.3
	65			161	149.0	70.0	104.3
	66		44	162	150.2		105.3
	67			163	151.5		106.3
	68			164	152.8		107.3
	69		46	165	154.1		108.3
	70			166	155.4		109.3
	71			167	156.7		110.3
	72		48	168	158.0	70.5	111.4
	73			169	159.2		112.4
	74			170	160.5		113.4
	75		50	171	161.8		114.5
	76			172	163.1		115.5
	77			173	164.4		116.5
	78		52	174	165.7		117.5
	79			175	167.0	71.0	118.6
	80			176	168.2		119.6
	81		54	177	169.5		120.6
	82			178	170.8		121.7
	83			179	172.1		122.7
	84		56	180	173.4		123.7
	85			181	174.7		124.7
	86			182	176.0	71.5	125.8
	87		58	183	177.2		126.9
	88			184	178.5		127.9
	89			185	179.8		129.0
	90		60	186	181.1		130.1
	91			187	182.4		131.1
	92			188	183.7		132.2
	93		62	189	185.0	72.0	133.2
	94			190	186.2		134.3
	95			191	187.5		135.3
	96		64	192	188.8		136.4
	97			193	190.1		137.4
	98			194	191.4		138.5
	99		66	195	192.7		139.5
119	100.0		67.0	196	194.0	72.5	140.6
120	101.1		67.8	197	195.4		141.7
121	102.3		68.7	198	196.8		142.9
122	103.4		69.5	199	198.2		144.1
123	104.5		70.4	200	199.6		145.3
124	105.7		71.2	201	201.0		146.5
125	106.8		72.0	202	202.5		147.7
126	108.0	67.5	72.9	203	204.0	73.0	148.9
127	109.1		73.8	204	205.4		150.1
128	110.3		74.6	205	206.8		151.3
129	111.4		75.5	206	208.2		152.5
130	112.5		76.3	207	209.6		153.7
131	113.7		77.2	208	211.0		154.9
132	114.8		78.0	209	212.5		156.1
133	116.0	68.0	78.9	210	214.0	73.5	157.3
134	117.1		79.7	211	215.5		158.6
135	118.3		80.6	212	217.0		159.9
136	119.4		81.4	213	218.6		161.2
137	120.5		82.3	214	220.2		162.5
138	121.7		83.1	215	221.8		163.8
139	122.8		84.0	216	223.4		165.1
140	124.0	68.5	84.9	217	225.0	74.0	166.5
141	125.1		85.7	218	226.7		167.9
142	126.3		86.6	219	228.4		169.3
143	127.4		87.5	220	230.1		170.7
144	128.5		88.4	221	231.8		172.1
145	129.7		89.3	222	233.5		173.5
146	130.8		90.2	223	235.2		175.0
147	132.0	69.0	91.1	224	237.0	74.5	176.5
148	133.1		91.9	225	238.7		177.9
149	134.3		92.8	226	240.4		179.3
150	135.4		93.7	**227**	**242.1**		180.8
151	136.5		94.6	228	243.8		182.3
152	137.7		95.5	229	245.5		183.8
153	138.8		96.4	230	247.2		185.2
154	140.0	69.5	97.3	231	249.0	75.0	186.7
155	141.2		98.3	232	250.8		188.1

HIGHLIGHTS
and shadows



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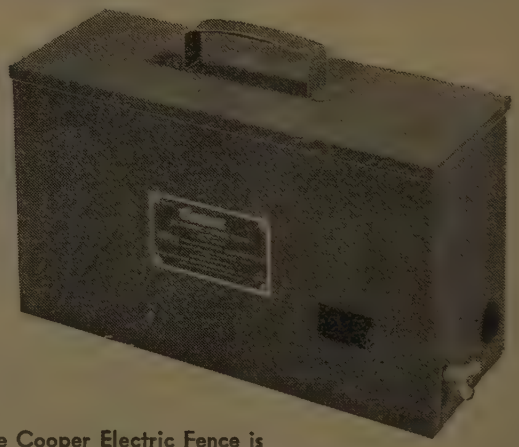

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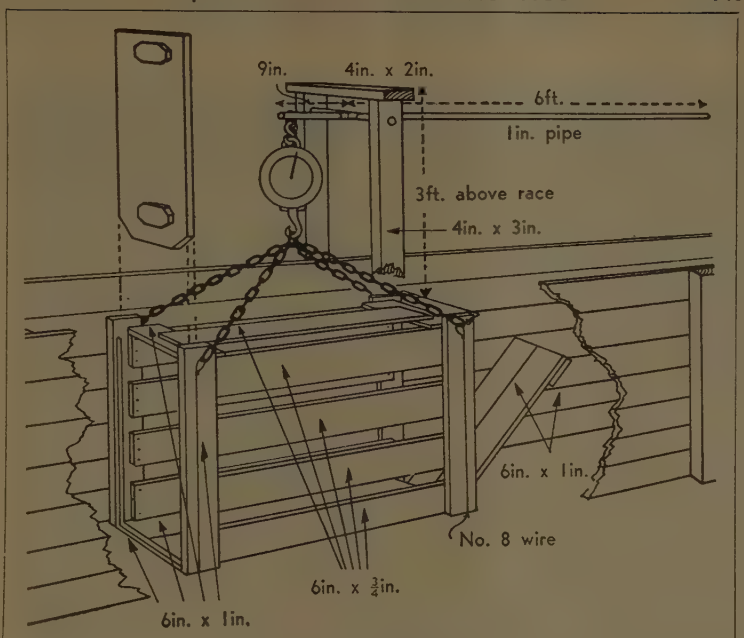
weights for market requirements and bring the highest prices to producers. Porkers should be sold between 60lb. and 90lb. carcass weight; that is, between 90lb. and 130lb. liveweight. Baconers should be sold between 130lb. and 160lb. carcass weight or 180lb. and 215lb. liveweight.

Though the marketing of pigs at the correct weight is most important, overfatness must also be guarded against, particularly in baconers. Overfat bacon is definitely not wanted either in New Zealand or overseas. The main cause of excessive fat is overfeeding after pigs have reached the age of 4 months. When large quantities of skimmed milk are available the temptation to give pigs of this size as much as they will consume is hard to resist, but does not pay. They should be fed not more than 5½ to 6 gallons of milk to each pig daily. If there is a surplus of skimmed milk on the farm at the height of the dairying season, it is much better to preserve it as curd for use for winter litters or for finishing off pigs in late autumn.

The future for the pig industry in New Zealand looks bright, but if full advantage is to be taken of the markets available, both in the Dominion and overseas, pigs must be marketed at the correct weights and must not be overfat.



Weighing crate and scales in a race. The crate should be 50in. long, 28in. high, and 13in. wide.

Pedigree Sow Records

Contributed by the Animal Industry Division

In the period January to June 1954 the following breeders had litters recorded as shown:—

Owner's name and address	Herd book number		Number of pigs		Litter weight		Litter grade*
	Sow	Sire	Born	Weaned	3 weeks lb.	8 weeks lb.	
Berkshire							
Snelling, F. R., R.D. 3, Whakatane	26670	28103	10	10	122	346	2
Snelling, F. R., R.D. 3, Whakatane	27980	28103	9	9	130.5	272	3
Ellerm, O. C., Palmerston North-Sanson R.D.	28239	28241	9	9	136	358	2
Tamworth							
Smith, F. E., Orongo, Turua	17432	17779	9	8	107	319	2
Jacobs, W. H., Matai, Ahaura	17448	16860	9	9	159	428	1
Jacobs, W. H., Matai, Ahaura	17761	16860	7	7	109	339	2
Large White							
New Plymouth High School Board, c/o J. N. Northcott, Farm Manager, 109 Pendarvis Street, New Plymouth	9932	10368	12	9	106	391	2
Harrison, E. W., P.O. Box 9, Palmerston North	9803	10711	10	7	116	373	2
Harrison, E. W., P.O. Box 9, Palmerston North	11166	10711	12	10	140	496	1
Harrison, E. W., P.O. Box 9, Palmerston North	11526	10711	10	9	113	376	2
Harrison, E. W., P.O. Box 9, Palmerston North	9802	11290	7	7	152	443	1
Harrison, E. W., P.O. Box 9, Palmerston North	9798	10711	10	8	112	343	2
Harrison, E. W., P.O. Box 9, Palmerston North	9796	11290	11	7	81	323	4
Harrison, E. W., P.O. Box 9, Palmerston North	11646	11290	12	10	126	465	1
Wood, A. E., R.D. 3, Whakatane	10035	10693	10	10	138	383	1
New Plymouth Boys' High School, P.O. Box 187, New Plymouth	9929	10765	12	8	97	241	4
Maclean, K. D., P.O. Box 1, Murchison	10350	9536	12	11	106	380	2
Donovan, G. C., R.D. Whitianga	10945	10639	12	10	105	244	2

Minimum Litter Weight for Grades

Grade*	3 weeks (lb.)	8 weeks (lb.)
1	120	360
2	100	300
3	90	270
4	80	240
5	70	210

Breed Averages for the Period under Review

Breed	Number of litters recorded	Number of pigs		Litter weights		Average weight per pig	
		Born	Weaned	3 weeks lb.	8 weeks lb.	3 weeks lb.	8 weeks lb.
Berkshire	4	8.8	8.5	103.9	313.8	13.3	37.8
Tamworth	3	8.3	8.0	125.0	362.0	15.6	44.0
Large White	12	10.9	8.7	116	371.5	13.4	42.9

* A No. 3 grade is classed as good, No. 2 as excellent, and No. 1 as special.

Dairy Production on Pumice Country

By C. R. TAYLOR, Fields Instructor, Department of Agriculture, Rotorua

BROADLY there are only two methods by which primary production may be greatly increased, the first depending on the development of land not already in production and the second resting on the ability and willingness of farmers to improve their present management practices. Both methods are vitally important to the Dominion's welfare. This article describes how dairy production has been substantially expanded on a pumice country farm through the adoption of better management practices.

THE farm, which is owned by Mr. A. D. Dibley, is situated on the Oturoa Road, about 5 miles north-west of Ngongotaha. In all it comprises 245 acres, mostly in grass, but only 80 acres are used for dairying, because a deeply cut gully makes it impracticable to move milking cows twice daily from one side to the other. The area used for dairying is discussed in this article.

Purchased by its present owner in 1928, the property at the time was in a fairly advanced state of development in its fencing, water supply, buildings, shelter belts, etc., but the general quality of pastures was not high owing to consistent understocking and insufficient topdressing. It carried 35 milking cows and necessary replacements. Butterfat production was under 90lb. per acre.

During the next 20 years Mr. Dibley on two separate occasions ploughed every paddock but one on the 80 acres used for dairying, the aim being to renew pastures in a 10-year cycle with a swede crop between old and new grass. Thus it was hoped to keep pastures both vigorous and productive.

In addition all the larger paddocks were subdivided so that finally none was greater in area than 6 acres; each was provided with an adequate water supply and where necessary barberry was planted to give additional shelter. Topdressing with phosphatic fertilisers was regularly and liberally practised, apart from the war years, when fertilisers were in short supply, and at

Upper left—A paddock in which a potash topdressing trial was laid down in 1949. The left inset shows a portion of the pasture which received 1cwt. of potash annually for 2 years and on which clover growth improved considerably, and the right inset shows a part not treated with potash and having poor clover growth. Middle left—Regular and frequent grassland harrowing when the dung is soft and spreadable is considered to be of the utmost importance in successful pasture management. Lower left—Bare ground, flat weeds, and stunted lucerne are typical symptoms of potash deficiency in pumice country lucerne stands. The portion on the right of this stand was treated with potash and that on the left received none.

Farm Doubled by Good Management

times some lime was also applied. Whenever seed was used, no matter what its purpose, only the highest quality procurable was purchased. In short an honest attempt was made by Mr. Dibley to improve his position with the knowledge and resources he possessed. Yet, in spite of all this, by the end of the 1948-49 season pastures were still not satisfactory and only 45 cows were being milked for an average butterfat yield of 121lb. per acre. Obviously something was amiss which called for investigation.

In April 1949 advice was sought concerning unthriftiness in a young lucerne stand of about 5½ acres and also in the pasture of one paddock which was particularly poor for no apparent reason. Soil samples were taken and tested, the results pointing clearly to at least one serious trouble. Phosphate and lime were shown to be present in abundant amount for optimum growth of both lucerne and pasture, but in each case potash was very deficient.

Unfortunately potash fertilisers at this period were difficult to procure in any quantity and so for a year or two Mr. Dibley had to be satisfied with only a few hundredweights per season. So convincing, however, were the responses to 1cwt. of muriate of potash per acre by the lucerne and pastures to which it was applied that no persuasion was required to have the remainder of the dairy farm treated with potash as soon as possible.

This enlarged programme of potash topdressing was begun in the spring of 1951 and has continued ever since, the rate being 1cwt. per acre each year, preferably applied during August and September. Indicative of the results obtained from the use of potash and other practices yet to be mentioned are the following butterfat figures from factory returns:—

Year	lb. per acre	Year	lb. per acre
No potash used		**Potash used**	
1948-49 ..	121.5	1950-51 ..	148.3
Potash used		1951-52 ..	208.5
		1952-53 ..	216.4
1949-50 ..	141.6	*1953-54 ..	250.0

* Estimate only, based on production to end of February 1954.

Upper right—The aftermath of a silage cut 4 weeks after the cut was taken in mid-November last year and before it was break fed to the dairy herd. The growth of short-rotation and perennial ryegrass, cocksfoot, and white clover is excellent. Inset—Oversowing pastures with short-rotation ryegrass assists in overcoming winter and early spring feed shortages. This photograph, taken last October, shows the length of growth and its leafiness. Middle right—Well-grown 18-month-old heifers with 3 or 4 older cows. They were wintered entirely on silage and pasture. Lower right—Autumn-saved pasture being fed in small breaks by use of the electric fence. Extensive use of the electric fence for break feeding pasture enables waste to be avoided.

Silage making is important on Mr. Dibley's farm, as no hay is made and no root crops are grown. When they are cut for silage pastures deteriorate less rapidly, recover quicker, and are higher in food value.

In the 5 years since potash was first used it has been possible to expand production to 250lb. per acre from the relatively low figure of 121.5lb. recorded in 1948-49 before potash was applied, an increase in excess of 100 per cent. Next season it is confidently expected to do still better, the target being 300lb. per acre.

Other Factors Increasing Production

Not all the credit can fairly be given to potash. Certainly potash was the principal limiting factor, the deficiency of which resulted in serious pasture deterioration, poor lucerne growth, and low animal production. It would have been quite possible, of course, to have applied the necessary amount of potash, received a certain measure of benefit in pasture improvement and animal production, and left the matter at that. But this was not Mr. Dibley's idea of up-to-date and progressive farm management.

The numerous practices adopted to supplement the good work potash had begun included:—

1. **Elimination of night paddocks:** Previously day and night paddocks were used, as was common on most dairy farms at the time, but this practice was abolished 5 years ago.

2. **Break feeding with electric fence:** This system of pasture grazing was introduced in substitution of the old day and night paddock routine and is continued over the full dairying season.

3. **Pasture harrowing:** Previously this had been practised only three or four times a year, but after the introduction of break feeding, etc., pastures were harrowed immediately the herd was removed from one field to another. Excellent results have attended this practice.

4. **Oversowing:** To provide more winter and early spring feed all pastures have been oversown with short-rotation ryegrass. This is done about March of each year by mixing 5lb. of seed per acre in the autumn topdressing. Pastures are grazed fairly hard before being harrowed and oversown. If necessary, this treatment is repeated the following year, the seeding rate being adjusted to the requirements of each field.

Free Bulletins for the Dairy Farmer

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248 Liver-fluke of Sheep and Cattle.
256 Liquid Manure.
260 Handbook of Mechanical Milking.
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347 Farm Dairy Instruction.
360 Feed Taints in Cream.
364 The Feeding and Management of the Sow and Litter.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

5. **Silage:** Large quantities of this material are made from surplus pasture growth. Little or no hay is now saved, and root cropping has been abandoned. All classes of stock have thrived on silage alone, but it is good silage fed generously.

6. **Autumn-saved pasture:** Each year 25 to 30 acres are closed from late April to mid-May for break feeding to early calvers in July and August; that is, about a third of the farm. During this period the oversown short-rotation ryegrass makes vigorous growth and provides an enormous amount of first-class milk-producing feed when most required. Winter grazed paddocks are then closed for silage after thorough harrowing to spread animal manure and after being liberally topdressed.

7. **Topdressing practice:** Apart from potash, which is applied in spring, phosphate, preferably serpentine superphosphate, is put on twice a year at 2cwt. per acre on each occasion, usually September and March. This replaces the old practice of topdressing once a year, when it was customary to apply 3cwt. only in autumn.

Meteorological Records for June

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	53.1	+ 1.0	69.8	29.5	4.93	18	— 2.15	2.72	6	131.3
Auckland	160	55.0	+ 2.0	67.9	37.1	3.85	21	— 1.54	0.93	6	110.1
Tauranga	10	51.3	+ 1.4	68.1	29.8	2.75	13	— 2.80	0.86	6	138.5
Ruakura	131	49.0	+ 1.5	66.1	22.2	3.82	17	— 0.96	0.60	9	111.3
Rotorua	975	48.2	+ 1.8	66.0	28.3	3.73	13	— 1.59	0.77	17	125.0
Gisborne	12	50.5	+ 1.7	68.9	30.1	1.74	11	— 2.47	0.77	9	162.3
New Plymouth ..	160	52.4	+ 2.3	63.0	32.0	5.55	18	— 0.63	1.12	6	110.6
Kariol	2125	43.7	+ 2.2	59.5	22.0	5.28	18	+ 0.18	1.03	7	
Napier	5	50.1	+ 1.4	67.7	28.8	1.05	5	— 2.01	0.43	26	154.9
Wanganui	72	51.7	+ 2.9	65.0	33.2	3.66	16	+ 0.27	0.59	26	97.8
Palmerston North .	110	49.5	+ 2.5	65.0	26.5	4.15	17	— 0.20	0.88	12	86.4
Waingawa	340	47.3	+ 1.9	66.7	23.0	2.64	12	— 1.45	0.65	9	121.3
Wellington	415	50.3	+ 2.6	64.1	35.4	4.33	12	— 0.32	1.14	16	99.9
Nelson airfield ..	5	46.9	+ 2.8	63.8	25.1	4.35	10	+ 1.06	2.10	16	141.2
Blenheim	12	47.6	+ 2.7	67.2	26.3	3.21	8	+ 0.73	2.00	16	149.3
Hokitika	15	47.7	+ 3.4	59.9	29.4	11.83	22	+ 3.00	2.51	7	65.4
Hanmer	1270	43.2	+ 3.5	63.0	21.0	5.14	12	+ 1.65	1.69	12	100.5
Christchurch ..	22	46.2	+ 3.0	65.0	25.3	1.42	7	— 1.17	0.55	26	117.6
Ashburton	323	46.6	+ 4.8	68.0	24.2	1.19	7	— 1.41	0.61	17	109.2
Timaru	56	47.0	+ 4.6	65.1	26.9	1.01	7	— 0.86	0.35	17	92.3
Alexandra	520	42.9	+ 5.2	67.4	22.9	0.88	9	+ 0.09	0.40	18	100.9
Taieri	80	45.4	+ 3.6	65.5	26.0	2.35	13	+ 0.03	0.86	17	61.5
Invercargill airfield	0	44.8	+ 3.2	65.0	29.0	5.57	24	+ 1.92	0.99	14	52.8

Tomato Culture in Small, Home Garden Glasshouses

SMALL glasshouses are used extensively for tomato growing by home gardeners in New Zealand. Most of the houses are very small, within the range of about 6 to 8ft. wide by about 8 to 10ft. long, but if small houses are well managed their production can be important in the economy of the household of the home gardener. Small houses are usually used for crops that begin to bear about 4 to 8 weeks earlier than outdoor crops and continue in bearing until late summer. In the first part of this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses tomato culture in small glasshouses. The section of the article on routine work in the home garden in September is by W. G. Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

TOMATOES are not difficult to grow if given certain minimum conditions of light, moisture, nutrition, and temperature, but generally considerable experience and skill are needed to grow heavy crops consistently, because disease is a potent factor in reducing yield, and for heavy crops the optimum or nearly the optimum needs of the plants must be met.

Site

Choice of a site for a small glasshouse is restricted in most home gardens, but a situation that is not overshadowed or in a hollow which may be a frost pocket and which is sheltered from prevailing cold winds should be chosen. The subsoil or second spit should be above the water-table to avoid risk of root drowning. A good supply of clean water is essential for watering.

Types of Houses

Houses are usually rectangular and the lowest side wall or walls, including the foundation above the ground, should be from about 5ft. 6in. to about 6ft. high. One of two principal types of roof construction is commonly used:—

(a) The span-roof house, which may be even span (gable roofed) or uneven span.

(b) The lean-to: A simple flat-roofed house, the wall on one side being higher than that on the opposite side.

The lean-to and uneven-span houses usually have the south wall of a solid material such as wood, concrete, or brick and the long slope of the roof facing north or nearly so. A lean-to house is usually built against another building.

Orientation

On existing evidence the most satisfactory arrangement is for the even-span house that is not used for very early crops to lie with ends to the north and south, and for the uneven span house and the lean-to house to lie with ends east and west and be used for the earliest crops.

Glass

Light is very important in tomato growing and the panes of glass should be clean and preferably large. Sizes 16 by 18in. and 18 by 18in. are commonly used in the newer houses, though larger sizes of glass may be used. To withstand hail glass for the roof should be 22oz. or, preferably, 24oz., but 18oz. glass is usually satisfactory for the sides.

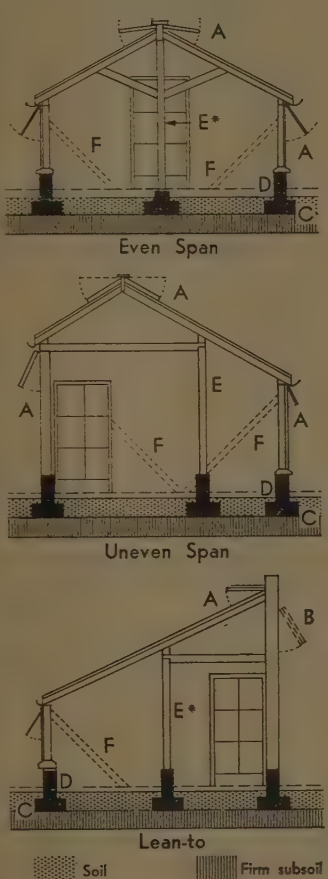
Heating

Small glasshouses are usually heated by units which will give protection against frost or prevent night temperatures from falling below 45 to 50 degrees F.

If a reliable make of electric soil-warming cable or low-voltage electric warming with a transformer and galvanised steel wire is used, the maintenance of space temperatures higher than 40 degrees F. is not required, as the temperature of the soil is maintained at from 57 to 60 degrees. Under these conditions a small kerosene-burning space heater only will be necessary on frosty nights as a protection against frost damage to the plants early in the season.

With this combination of electric soil warming and space heating, as a safeguard against damage to the plants by low space temperatures, heating costs are considerably lower than with conventional methods of heating.

Types of Small Glasshouses



A—Ventilators. B—Alternative position for top ventilator. C—Foot of foundation resting on firm subsoil. D—Foundation wall. E—Support post. * Unnecessary in shorter-span houses if suitable astragal bars are available and suitable bracing is used. F—Bracing on end walls.

A good type of lean-to house with shed attached.

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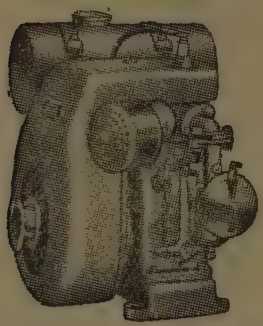

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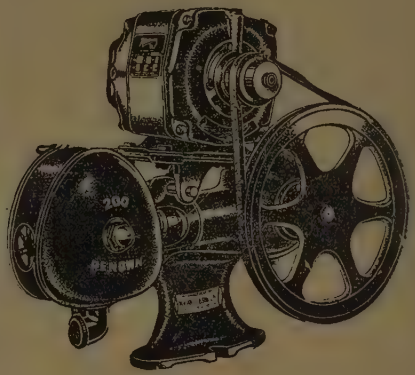

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For a small glasshouse of about 100 sq. ft. a reliable make of 230-volt soil-warming cable is the most economical installation, as this dispenses with the need for a transformer. For houses above this size a transformer supplying low-voltage current to galvanised steel wire buried to a depth of from 9in. to 12in. below each row of plants can be recommended. For further particulars of these types of installations the nearest Horticultural Instructor and electric power board should be consulted.

Varieties

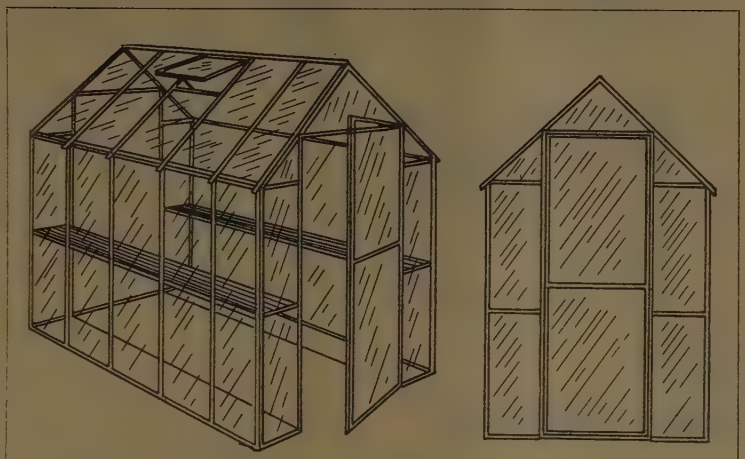
The principal factors which are usually considered in choosing a variety are earliness, weight of crop, vigour (particularly of the root system), and resistance to disease, especially to leaf mould. Flavour and shape of fruit are important, but are greatly influenced by growing conditions.

Potentate is the commonest variety grown commercially, largely because of its earliness and yield, but it requires careful management, as its root system is not as vigorous as that of many other varieties.

There are too many good varieties to list, but the following include some of the most popular: Ailsa Craig, Bay State, Best of All, Carters Sunrise, E.S.1, E.S.5, Exhibition (Stoners), Harbinger, Kondine Red, Market King, Melville Castle, Moneymaker (Stoners), M.P. (Stoners), Potentate, Potential, Prolific (Stoners), Radio, and Single Cross.

Varieties vary in their reaction to conditions such as heavy or light soils, bright sunshine, and temperature, and if a variety has not given satisfaction though its treatment has been reasonably good, another should be tried.

When first available Bay State was resistant to leaf mould, but its resistance appears to have been broken down in some districts.



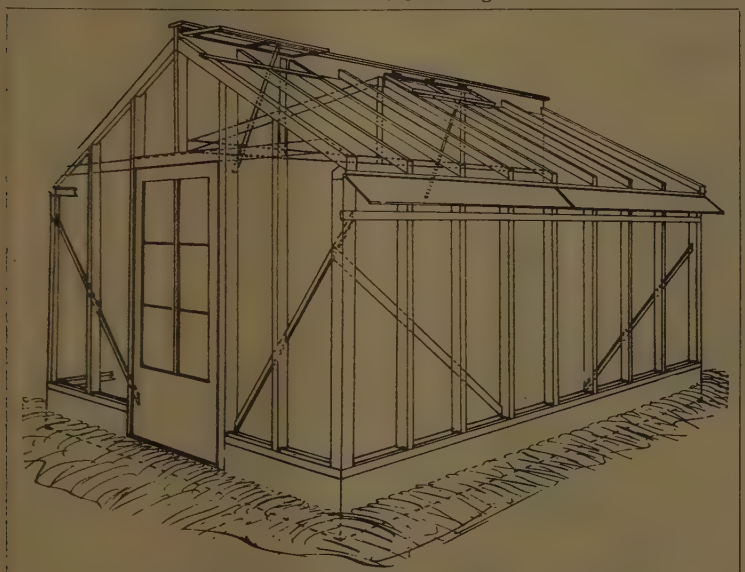
A small, simply constructed glasshouse. When the shelving is removed it is suitable for tomatoes.

Varieties resistant to leaf mould are available from time to time and well worth a trial in houses where the disease is difficult to control.

Time of Planting

Small houses are usually planted in spring about 4 to 8 weeks before outside tomatoes in the district are set out; that is, usually about 4 to 8 weeks before the date of the last killing frost, which usually occurs, according to district, from about mid-October until about the second week in November.

If small houses are planted earlier, the heating and attention needed are considered by most home gardeners to be out of proportion to returns. If houses are planted much later, that is, less than 4 to 5 weeks before outside crops are set out, full advantage is not being taken of them.



A small glasshouse (13ft. x 9ft. 10in. outside measurements).

Planting

Plants are commonly set out in double rows across the house. There is a central path if it is an even-span gable house or a path along the back close to the wall if it is an uneven-span or lean-to house with a back wall of wood, brick, or similar solid material.

Plants are usually set 12 to 14in. apart in the rows, with the rows alternately 18 and 27in. apart, giving space for attending to the plants on each side of each double row.

Where the water-table is low the double rows can be set in a shallow trench to facilitate watering and top-dressing. The depth of the trench should not be such that the roots are growing in infertile subsoil. Though planting with the rows across the house is almost universal, length-wise planting has merit, particularly for watering and attending to plants. Double rows as described above run the length of the house with a cross path, usually in the centre or where the tap is, though paths at the ends are sometimes desirable for additional access to different parts of the house.

Choice of Plants

Plants for setting out should be sturdy, about 6in. high, and dark green. They should have a strong, well-developed root system, which should be disturbed as little as possible when they are taken from the seed tray. Many nurserymen set more plants to the tray than is desirable. Frequently a tray with inside measurements of about 19in. x 14in. contains 70 plants, whereas under most circumstances 50 should be regarded as the maximum. Plants are usually better if the tray contains fewer.

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P.6

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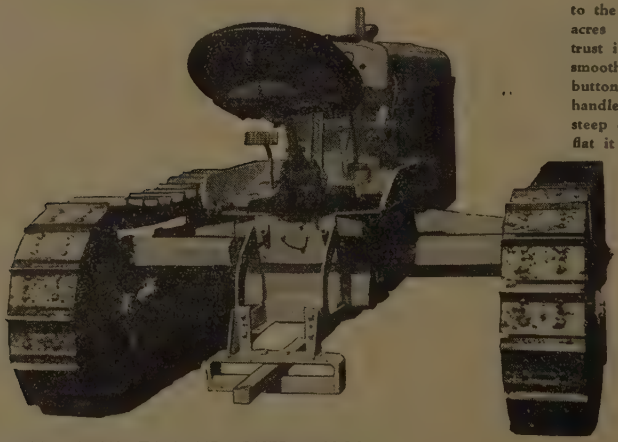

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Setting out, Watering, Soil Temperature

Before planting is begun the soil should have been cultivated and manured and should be moist enough for good growth. The plants in the tray should be watered thoroughly and any with leaf distortion, blotch, or mosaic markings should be discarded. The hands should be washed before the remainder are handled. The roots when exposed should be clean, white, and healthy.

The young plants can be set a little deeper than they were in the tray. If the plants have become elongated through being left too long in the seed trays, the bottom leaves may be trimmed close to the stem and the plants set deeper, preferably at an angle, though deeper planting is recommended only if the soil is well drained and aerated and does not contain too much decaying organic matter. If it does, the stems may rot.

The plants should be watered just enough to settle the soil around the roots, as soon as they are set out. Subsequent watering needs judgment; enough water must be given to keep the plants healthy, but too much may encourage root rotting organisms and if the soil is very rich in nitrogen, may make growth unbalanced, to the detriment of the first truss.

Subsequently watering must be done in moderation, according to condition of the soil, amount of sunshine, and the temperature, the quantity applied being increased as the plants develop.

A soil temperature of about 57 degrees F. is desirable for planting. At lower temperatures growth is likely to be restricted.

Planting in Troughs or Tins

Plants may also be grown in troughs or in tins. Tins such as are used for kerosene (approximately 9½in. x 9½in. x 13in.) are the most suitable size, though biscuit tins (approximately 8½in. x 8½in. x 10in.) are sometimes used. Tins are less favoured than troughs, as they rust fairly quickly and the metal gets excessively hot when the sun shines on it and the roots near it are burnt. Tins are sometimes difficult to empty when filled with soil and roots.

Methods of securing supporting twine at bases of tomato plants. The twine is attached to an overhead wire and wound around the plant to support it. The end of the twine may be secured against the stem (A) or to a bent wire thrust into the ground (B).

Plants in troughs and tins need more frequent watering than plants in the ground with the result that the air in the house may be kept excessively humid. As plants set out in tins or troughs have less soil than those in the ground, deficiency diseases, often due to too great an accumulation or to disproportion of fertiliser salts, are more common than among plants in the ground. The advantage of tins or troughs is that as the volume of soil is less, soil changing is easier. In addition, in ground where the water-table is high and drainage poor the plants in troughs or tins are raised above it, whereas raising the ground soil level may result in rotting of the bottom plates of the framework of the house.

Supports for the Plants

Plants may be supported by twine attached to overhead wires or by stakes driven into the ground. Stakes are less favoured, as unless they are treated with wood preservative they soon rot. They are more likely to carry over pests and diseases and they tend to shut off light, as collectively they form a fairly large mass.

If wires are used, they are usually stretched across the house at a height of about 6ft. from the ground, one wire to each single row. They should be supported by the framework, usually the top wall plates. The astragal bars should not be used for support, as the weight of a row of laden plants may cause them to sag.

One end of a length of twine is tied to the wire above each plant. It may be secured to a piece of bent wire thrust into the soil near the base of the plant or tied loosely to the plant near the base as shown in the illustration below. It should not be tied tightly or it may constrict the developing stem. The plant as it grows is twisted around the twine.

Pruning and Stopping

Tomatoes under glass are usually grown with a single stem, and side shoots which develop in the axils of the leaf stalks are usually broken out by grasping their ends as soon as they are large enough to handle with the thumb and forefinger. They should not be pinched out, as virus disease may then be spread by the fingers.

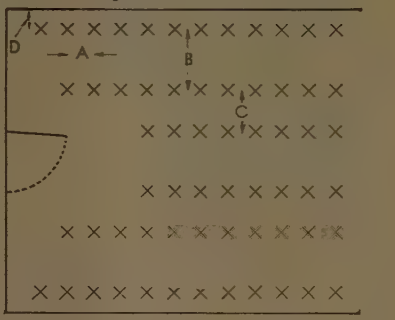
Ideally, all leaves have a useful purpose, but under glass, where plants are growing closer than in nature, some leaf pruning is usually necessary.

Leaves around the base near the soil are subject to splashing during watering, and disease frequently starts there. The lowest leaves can be removed one short of the bottom truss when the fruit on it is the size of a large marble. The leaves should be trimmed off flush with the stem.

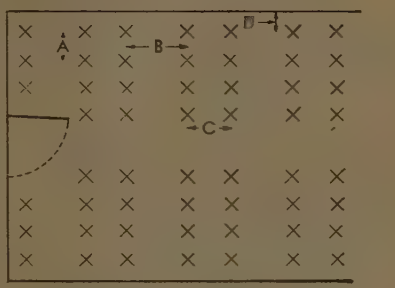
Where the foliage is heavy the plants will tend to fill the house, shade the fruit unduly, and prevent the circulation of air. Some further thinning may then be justified. The recommended method is to cut out completely a leaf here and there. Not more than one leaf should be removed between each truss, and cutting should not be confined to the side of the plant facing the path, where circulation of air is best.

Systems of Planting Glasshouse Tomatoes

No. 1: Lengthwise



No. 2: Crosswise



A—Distance plants are apart in the rows (12in. to 14in.). B—Distance double rows are apart to allow access to the plants (27in.). C—Distance apart of rows in each double row (18in.). D—Distance of plants from walls (minimum of 6in.). Wider spacings than those given may be necessary where growth is vigorous. In No. 1 house a cross path will be necessary at the tap unless the tap is at the door.

Pinching or cutting out the top growing point of the plant after the desired number of trusses has been formed so as to swell the fruit more quickly has not much to commend it. The fruit rarely ripens more than a few days earlier than on plants that have not been stopped.

Fruit Setting and Overhead Spray

The air, the soil, and the subsoil must not be permitted to become too dry or the flowers may fail to set. A light spray overhead between about 9.30 a.m. and 10.30 a.m. each day from the time the plants are established is desirable if the weather is dry. It reduces to some extent the need of the plant for water at the roots and is usually done by holding the finger over the nozzle of the hose and squirting a fine spray in the air over the plants. In hot, dry weather overhead spraying may have to be repeated several times during the day, but it should be avoided in late afternoon,

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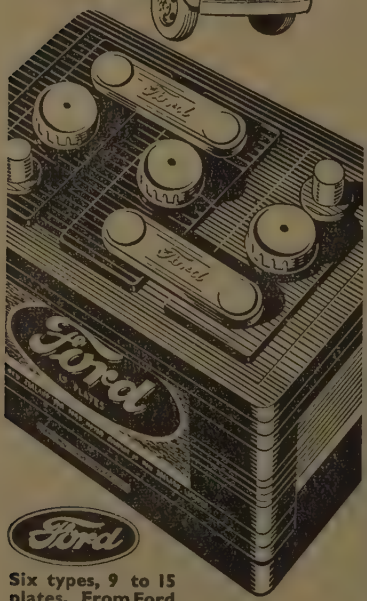

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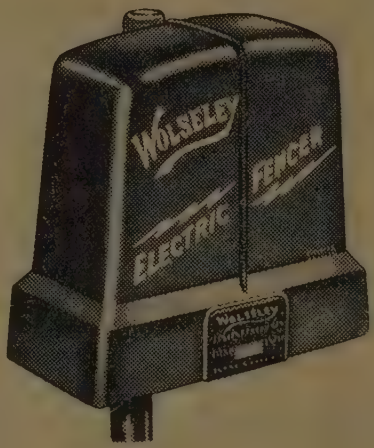

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as the plants may then be wet overnight, and diseases such as botrytis and leaf mould may be encouraged.

Fruit-setting Hormones

Fruit-setting hormones can be used where normal setting has failed. The spray is usually mixed with water and the mixture sprayed with an atomiser to wet the ovary in the centre of the calyx. Where only a few plants have to be treated the truss can be dipped into the mixture. As far as practicable only the flowers should be wet by the hormone, as growing shoots may be injured by it.

Air Temperatures

Extremes of temperature should be avoided. Temperatures of 75 to 85 degrees F. on sunny days and about 65 degrees F. on dull days with night temperatures of about 60 degrees F. are satisfactory.

Shading on Glass and Walls

Shading is usually advisable in hot summer weather, as glasshouses then tend to get excessively hot. Hydrated lime and water or flour and water can be mixed to the consistency of creamy milk, or, if lighter shading is wanted, to the consistency of skimmed milk and sprayed on to the roof and walls.

For a more permanent wash, such as is used to reflect light from inside walls of material such as wood, brick, or concrete, the following is recommended:—

1. Make a cream of 50lb. of hydrated lime and 7 gallons of water.
2. Dissolve 6lb. of salt in 3 gallons of boiling water.
3. Mix 1 and 2 when cold.
4. Stir 3lb. of Portland cement into 3.

Soil

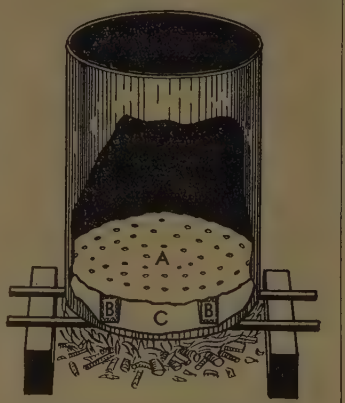
Tomato plants grow well in a wide range of soils that are well drained and supplied with moisture and plant nutrients. Most soils are improved by organic matter such as rotted straw, strawy horse manure, or sterilised compost.

Where drainage is poor it should be improved by the installation of field pipes. The heavier types of soil should be dug deeply and the subsoil should be loosened but not brought to the surface.

Manures

Base fertiliser: It is usual to apply a base fertiliser about 7 to 14 days before planting out. A complete fertiliser containing nitrogen, phosphoric acid, and potash is recommended, and one likely to give good results over a wide range of soils is made up as follows (by weight): 4 parts of blood and bone, 1 part of sulphate of ammonia, 4 parts of superphosphate, and 1 part of sulphate of potash. It should be mixed thoroughly and can be applied at from about 4oz. to about 10oz. per square yard, according to the fertility of the soil.

Topdressing: Subsequent dressings depend on the fertility of the soil and the growth of the plants. It is usual to topdress with a complete fertiliser about 6 to 8 weeks after the plants have been set out and thereafter at fortnightly intervals, but if the soil is rich and growth strong, topdressings may be greatly reduced or left until very late in the life of the plant. Where growing conditions are exceptionally good they are not needed.



A container for sterilising soil can be made from a 5-gallon drum. The top should be covered with a lid or wet sacking to retain heat and prevent loss of too much steam. A—Cut-out top of drum, in which small holes are punched to facilitate entry of steam into soil. B—Bricks. C—Water. Soil is placed on A.

Lime: If applied according to need, lime improves the physical condition of most soils, reduces soil acidity, assists in the availability of certain plant foods, and improves conditions for beneficial soil organisms. Carbonate of lime is generally used and may be applied annually at from 2oz. to about 8oz. to the square yard, according to the acidity of the soil; 3oz. to 4oz. per square yard applied during the autumn digging gives satisfactory results on most soils. As the effectiveness of lime depends on its being in intimate contact with the soil particles, it should be well worked in during digging.

Soil Disinfection

Hygiene is one of the most important factors in successful tomato growing, and the soil should be free from diseases that attack tomatoes. Medium loam that has been down in grass for several years is probably best, but is rarely available to the home gardener, who usually must use soil that has grown ornamentals or crops of vegetables. Such soil is usually contaminated with organisms which are inimical to the growth of tomatoes.

Soil may be disinfected by heat, usually with steam. However, heat is not usually practical for the home gardener, except in the treatment of very small lots of soil such as are used for seed sowing, where a common method is to use the family wash boiler or an oil drum as illustrated on this page. The temperature of the soil should be raised to at least 180 degrees F. and held for about 10 minutes.

Formalin: Use of formalin is the most convenient method of treating soil for the home gardener. Formaldehyde (40 per cent.) is used at the rate of 1 gallon mixed with 49 gallons of water to an area of 15 sq. yds. Where disease has been severe the area can be reduced to 10 sq. yds.

Application should proceed by simultaneously turning the soil and wetting it with the formalin solution. The soil should be saturated and left for 3 or 4 weeks before planting. The glasshouse must be left empty, as the vapours will injure plants up to 3 weeks and possibly 6 weeks later, according to weather or ventilation. For best results the soil should be covered with wet sacks for a few days after application of the formalin. Heaps of soil can be treated by saturating 6in. layers with a 2 per cent. solution as the heap is built and finally covering the whole with wet sacks for 48 hours; 50 gallons of diluted formaldehyde will saturate about 1¼ tons of soil.

Insect Pests and Diseases

Insect pests and diseases of tomatoes were discussed in "Growing Tomatoes in Glasshouses", in the May and June 1953 issues of the "Journal".

Work for September

September is regarded as the month in which gardening operations are begun in earnest in most parts of New Zealand. In the north most seeds can be sown with comparative safety, but seeds of the more tender crops such as marrows, pumpkins, etc., should be sown only in frost-free localities. In the South Island, where the season is generally later, there is still no hurry to sow seeds intended for main crops if these are likely to be injured or lost by frosts. Some frost protection, such as that given by cloches, will still be necessary for frost-tender plants.

Seed-bed

It cannot be over-emphasised that in the cultivation of vegetable crops raised from seed much of the success depends on the preparation and condition of the seed-bed in the early stages. It is impossible to grow first-class crops from seedlings which have been weakened or hindered in their early growth through unfavourable conditions. The most important point at this stage is to see that the soil is reasonably warm and friable and will break down readily when raked.

Autumn-sown crops such as silver beet, cabbage, lettuce, and cauliflowers will respond well to frequent applications of liquid manure, which is best applied when the ground is moist. Liquid manure can be made from animal manure placed in a bag or sack and suspended in a drum or barrel of water until the water is the colour of strong tea. If animal manure is not available, nitrate of soda at 2oz. to 4 gallons of water will promote rapid growth; 1 pint of liquid manure per plant is sufficient at a time. Care should always be taken to see that the

liquid does not touch the leaves or stems.

Now that plants are making growth any root crops left in the ground over winter should be lifted and used. If allowed to remain in the soil for long, the plants will run to seed. Plots from which such root crops have been removed should be dug over and if not required immediately are best sown down in a green crop, which can be dug in later and will thus help to put the soil in good physical condition for planting in vegetables for autumn or winter use.

Fertilisers

In most home gardens cropping is fairly intense and consequently plant foods must be added regularly if good yields are to be obtained. There are two main ways of applying fertilisers. One method is to broadcast them over all the ground to be cropped and the other is band application. In band application the fertiliser is applied along the row below the seed. A drill is taken out two or three times the depth to which the seed is to be sown, the manure is applied and mixed with the soil, and the row is filled in to the depth required for seeding. This method is preferable for most crops and is more economical than broadcasting fertiliser.

For the average garden 3oz. of superphosphate to the square yard is all that is required as a base dressing. Nitrogenous manures, which are required by leafy vegetables particularly, can be applied at intervals as side dressings.

Plantings

Cabbages: With the varieties of cabbage available a continuous supply can be provided all the year. Good varieties to set out now in the North Island include Golden Acre, Enfield Market, and Hendersons Succession and in the South Island Flower of Spring and Golden Acre.

Cauliflowers: Suitable varieties for setting out now are Southern Cross and All Year Round.

Potatoes: In favoured localities Arran Banner and Epicure may be planted. In most areas the planting of main-crop varieties, such as Aucklander Short Top and Arran Chief, is better left until October.

Lettuces: Plants raised under glass or in a hot-bed should now be set out. A good dusting of lime over the area will do much to keep birds, which are hungry at this time of the year, away and will also help to eradicate slugs.

Onions: Main-crop onions should be planted now. Pukekohe Long Keeper is a good variety.

Sowings

Peas: Sowings of two or three varieties can be made at one time, if convenient. Suitable varieties to sow and which will provide a continuous supply over a long period include William Massey, Greenfeast, and Stratagem. Stakes are best put in at the time of sowing, as late staking often injures roots.

Onions: Sowings should be made as early as possible so that plants have as long a growing season as possible.

Lettuces are fairly hardy plants and often can be grown all the year. Good varieties to sow now are Great Lakes and Webbs Wonderful.

Spinach: Several small sowings are best made at 2-weekly intervals. The summer variety, which matures in 7 to 8 weeks, should be used.

Celery: It is too early to sow main-crop celery, but a small sowing can be made of the Golden Self-blanching variety. Plants should then be ready for setting out about the middle of December.

Beetroot: A good variety is Detroit Red. Only a small sowing should be made, as beetroot tends to run to seed when grown too early.

Silver beet: This is a most useful vegetable and stands well in the garden over a long period. Broad Rib and Lucullus are two good varieties.

Radio Broadcasts

RADIO broadcasts to farmers will be given during September as follows—

1YA Auckland, 7.15 p.m.

1 September—"Silage", by C. M. Blick, Fields Instructor, Department of Agriculture, Warkworth.

8 September—"Gumland Development", by C. E. Ballinger, Instructor in Agriculture, Department of Agriculture, Whangarei.

15 September—"Peat Land Development", by I. Elliott, Assistant Superintendent, Department of Agriculture's Rukuhia Soil Research Station.

22 September—"Pumice Land Development", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

29 September—"Young Farmers' Club Talk", by Waitemata district committee, Federation of Young Farmers' Clubs.

1XH Hamilton, 12.33 p.m.

2 September—"Care of Working Dogs", by W. R. Eaton, Livestock Instructor, Department of Agriculture, Hamilton.

9 September—"Supplementary Crops for Sheep and Cattle", by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

16 September—"Aspects of Dairy Farming", by R. Woolerton, Federated Farmers, Hamilton.

23 September—"Research on Weed Control", by F. B. Thompson, Department of Agriculture's Rukuhia Soil Research Station.

30 September—"Pest and Disease Control in Vegetables", by F. L. Bailey, Horticultural Instructor, Department of Agriculture, Auckland.

1YZ Rotorua, 7.15 p.m.

2 September—"Preparation of Land for Cropping", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

16 September—"Leptospirosis", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

30 September—"Farm Dairy Instruction Service", by G. Purvis, Superintendent of Butter Instruction, Department of Agriculture, Hamilton.

2XA Wanganui, 8 p.m.

2 September—"For the Countrywoman", by Mary MacDonald.

9 September—"The Radio Vet.", by S. Jamieson, Veterinarian, Wanganui.

16 September—"The Production of Porkers for Overseas Trade", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

23 September—"Chick Raising", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

30 September—"Potash Topdressing", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

14 September—"Practical Hints on Chicken Raising", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

28 September—"Cultivation", by A. J. Coughlan, Instructor in Agriculture, Department of Agriculture, Napier.

2ZA Palmerston North, 12.30 p.m.

6 September—"Will the Old Cow Breed Again?", by A. W. Hart, Veterinarian, Department of Agriculture, Palmerston North.

13 September—"Land Improvement through Giant Discing", by L. W. Blackmore, Instructor in Agriculture, Department of Agriculture, Dannevirke.

20 September—"Feed Flavours in Milk and Cream", by M. J. McFetridge, Special Inspector, Department of Agriculture, Palmerston North.

27 September—Y.F.C. session, by I. G. Tabor.

3YA Christchurch

9 September (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

13 September (12.20 p.m.)—Y.F.C. talk, arranged by the chairman of the Marlborough district committee, Federation of Young Farmers' Clubs.

4YA Dunedin, 9.15 p.m.

1 September—"In Spring—the Busy Beekeeper", by L. J. S. Line, Apiary Instructor, Department of Agriculture, Invercargill.

8 September—"Poultry Diseases", by W. G. Proudfoot, Poultry Instructor, Department of Agriculture, Dunedin.

15 September—"Beef Cattle Production"—discussion between farmer and livestock officer.

22 September—"Farming in South Otago—Inchclutha"—discussion by J. G. Richards and A. G. Kennelly, both of the Department of Agriculture, Dunedin.

29 September—"Farming in South Otago"—discussion between farmer and J. G. Richards, Department of Agriculture, Dunedin.

Regular Sessions

1XH Hamilton, Mondays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m., Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m., Saturdays at 6 p.m. (Auckland stock market report).

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m., Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., and 9.15 p.m., Thursdays at 12.33 p.m.

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Controlling Seepage from Rotten Rock Outcrops

By K. L. MAYO, Instructor in Agriculture, Department of Agriculture, Invercargill

SOME hill country in Southland and South Otago consists of bedded rocks, some of which are more resistant to weathering than others. The more-weathered rocks occasionally appear as outcrops of what is commonly called "rotten rock", and local wet areas often occur just below these outcrops. Though these wet areas are not large, they keep an appreciable area of land wet throughout the year, interfere with cultivation, and drown crops. Drainage is therefore worth while, particularly in those areas which can be cultivated.

THE fact that these wet areas appear high up on the slopes, where water should be able to flow away easily, puzzles many farmers. The reason for the appearance of wet areas in these positions is that rain-water which is not immediately taken up by plants or by the soil seeps down through the pervious layers of soil until it meets an impervious layer (see Fig. 1). The rotten rock layers which outcrop on the sidelings are shattered and disjointed and act as a reservoir for this surplus water. It does not pass through this rotten rock, because in most cases this rock layer overlies a tight, impervious clay. As more water collects it has to flow somewhere, and as a result appears as weak springs or seepage at the surface in many places where the rotten rock outcrops. Because the soil immediately below this outcrop is composed of the impervious clay, the water flows over it instead of through it and wet conditions occur.

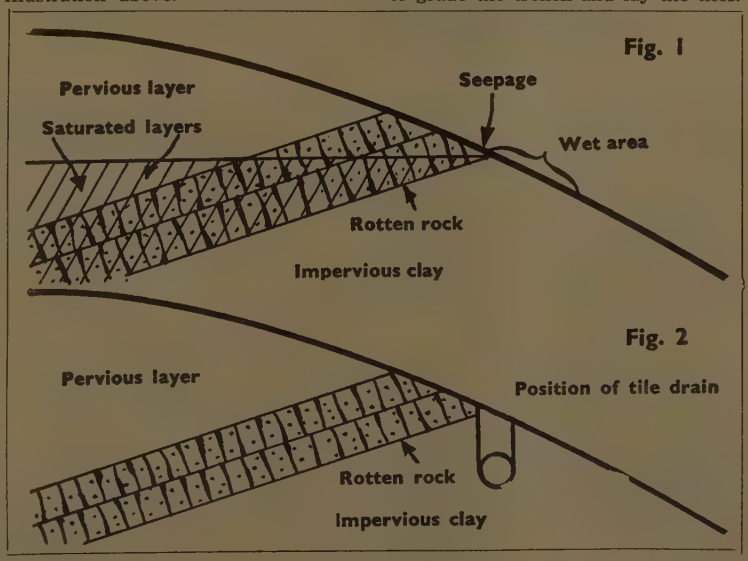
Drainage

The method of draining these wet areas is to install a tile drain across the slope along the edge of the rock outcrop and just below it, where the trenches can be dug easily in the clay and will thus act as a cut-off drain (see Fig. 2). The tile must have fall in it and must be set at such a depth as to be just below the bottom of the rock outcrop; otherwise the water will continue to pass underneath it. The tile drain should empty out into a gully or open ditch.

The rock layer may have weathered into soil at the surface, but it will be easy to locate with a soil spear, and as trenches are usually dug from the outfall end first, it will be possible to locate the rock outcrop and then cut or dig the trench along its edge. Because the country has plenty of fall, little difficulty will be experienced in keeping sufficient fall in the drain or in adjusting the fall should the rock outcrop ultimately prove to be in a slightly different position. A seepage area of this type which has been successfully drained by employing the methods outlined is shown in the illustration above.

Machinery

Unfortunately there is no suitable machinery readily available to handle this country. Possibly the most suitable machine for this work would be a back-acter bucket, which can be mounted on a 40 h.p. tracklaying tractor. This back-acter bucket is strong enough to withstand the conditions encountered along the edge of this rock outcrop, and when mounted on a tracklaying tractor it can be operated on sidelings and can be taken on to rough country. The particular job referred to above was done with a dragline excavator and the bottom was prepared for the tiles by hand. The dragline is not very suitable, because it cannot be taken on to most slopes, it digs a very wide trench, and it requires a great deal of hand work to grade the trench and lay the tiles.



HEADING PHOTOGRAPH: A view of the area discussed in this article. Note the position of the proposed tile drain across the slope to act as a cut-off for seepage.

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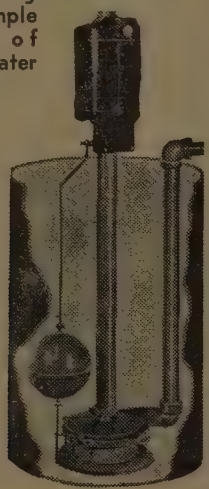

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Damage to Garden Plants by Hormone Weedkillers

By S. P. Money, Horticultural Instructor, Department of Agriculture, Wellington

WITH the rush of growth in spring and early summer, many gardeners resort to hormone sprays to control weeds. Hormone weedkillers, however, can be dangerous to garden plants and care must be taken to prevent the drift of hormone to plants other than those weeds which are to be killed. Spraying, therefore, should not be carried out on windy days.

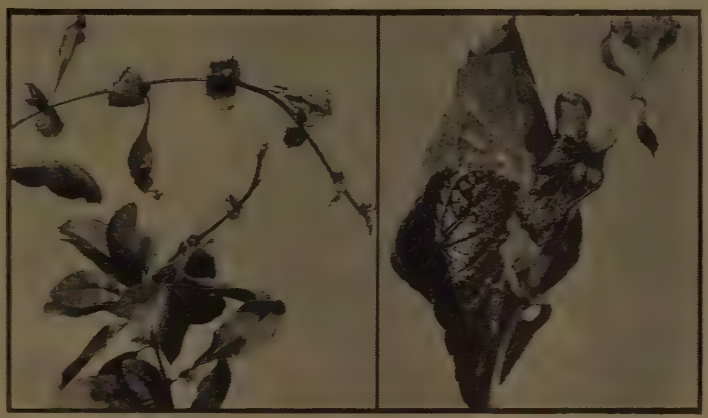
MUCH of the distorted foliage from home gardens brought into the offices of the Department of Agriculture for identification of the cause of damage can be traced to the application of hormone sprays in windy weather by the owner or one of his near neighbours.

With annual plants very little can be done to reduce the effect of hormone damage except perhaps the removal of distorted leaves. Badly damaged plants should be removed altogether. Lightly damaged plants should not be removed too hastily, because if they are left alone, they usually recover.

On woody plants the worst effect of the spray can be alleviated by hard pruning. This should be carried out as soon as damage is evident. The shoots should be removed well below the visible damage.

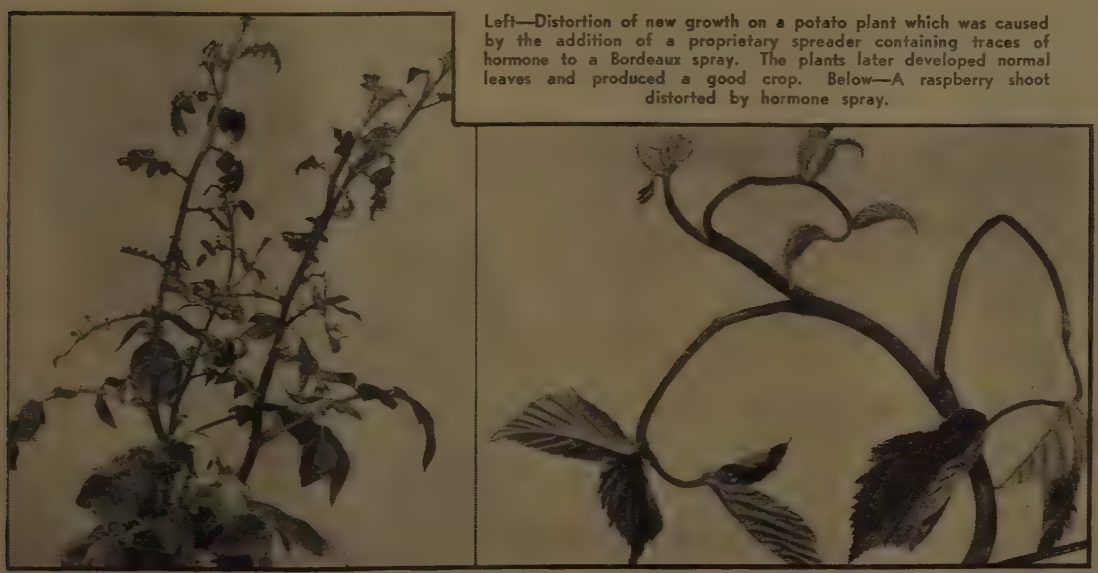
Even traces of hormones can cause damage to susceptible plants. Damage often occurs if the equipment used for hormone weedkillers has not been thoroughly cleaned before disease control sprays are used. Cleaning off all traces of hormone is difficult.

As a general rule spray equipment used for weedkillers should be kept solely for this purpose and should not be used for plant protection and nutrition sprays. There are both water- and oil-based hormone sprays and of these water-based sprays are the more readily removed. Immediately after a water-based hormone spray is used the equipment should be washed out thoroughly with water and then a solution of 5 per cent. ammonia and water should be allowed to stand in the spray for 24 hours. This should then be emptied out by being pumped out through the hoses.



Left—The damage which hormones can cause to japonica shrubs is shown in this comparison of an affected shoot (upper) and normal foliage (lower). Right—The first sign in hydrangeas of damage by hormones is the bending of the petioles shown here. This is followed by extreme contortion which often ends in the death of the plant.

With oil-based hormones the problem is more difficult. It is not possible to clear out all traces, because the leather washers of the sprayer absorb some of the material. By washing out the sprayer with kerosene and pumping this through the hose as a preliminary to washing as for water-based hormones it should be possible to clear the sprayer sufficiently to allow its use for other spraying purposes. It would be advisable to add a dessertspoon of household detergent to each gallon of water and to the water-ammonia solution in this case.



Left—Distortion of new growth on a potato plant which was caused by the addition of a proprietary spreader containing traces of hormone to a Bordeaux spray. The plants later developed normal leaves and produced a good crop. Below—A raspberry shoot distorted by hormone spray.

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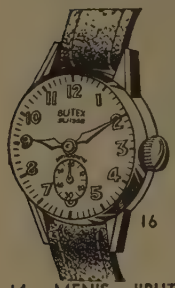

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CEREALS

THE Crop Research Division, Department of Scientific and Industrial Research, passes its newly bred strains and varieties of crops and introductions from overseas to the Extension Division of the Department of Agriculture for field testing and this work forms a large proportion of the Division's experimental programme with annual crops.

WHEAT

IN the season 1953-54 34 variety trials were sown, the majority of these being in the South Island. One series of trials was concerned with the further testing of promising lines which have consistently outyielded Cross 7 while equalling it in suitability for header harvesting. Unfortunately the most promising line is inferior in baking quality to Cross 7. It is possible, however, that further selection work by the plant breeder may improve the baking quality to a desirably high level. Some trials were conducted to find out whether the baking quality of this line could be improved by adding at sowing time various amounts of Hilgendorf, a very high baking quality wheat of medium yield. Varying proportions of Hilgendorf up to 40 per cent. have been used in these blends. Last season and also in this season the two varieties grew reasonably well together as blends. There was some reduction in yield, according to the amount of Hilgendorf used. It is not clear yet whether baking quality was sufficiently improved to make blending worth while.

In parts of South Canterbury and North Otago the variety Dreadnought is grown, mainly because of its very high yield and of the amount of grazing it provides and sometimes because of the large amount of good straw it produces and its weed-smothering ability. As it is subject to shaking, it is not suited to direct header harvesting. A header variety is desired in these districts and for several years trials have been conducted with this object in view. One line in particular, bred at the Crop Research Division, has shown promise, as it approaches the yields of Dreadnought, has long, clean, and heavy straw, resists lodging, and is suitable for header harvesting.

Trials to evaluate the use of the Australian variety Gabo for spring sowing have been continued. As it yields as well as Taiwan the standard variety, and surpasses it in strength of straw, Gabo is considered promising. However it was found in the 1952-53 trials that baking quality was variable. Two lines of Gabo of different origin gave very different baking tests, though they were very similar in other respects. Both of these were included in the 1953-54 trials. One line was of distinctly superior baking quality and will be preferred for further work.

BARLEY

Variety trials with barley in 1952-53 and 1953-54 consisted of comparisons of Kenia and a number of other Scandinavian-type varieties and Research. The other Scandinavian varieties all closely resemble Kenia in appearance, though it has become apparent that they differ somewhat in yields and in some important agronomic features. Rigel, for instance, has suffered frequently from neck break, with consequent loss of yield. The varieties Maja and Herta have shown promise for several years, and a third, Rika, also performed well in its first year of trial in 1953-54. All of the Scandinavian varieties tested are superior to Research in resisting lodging. The original Research used in New Zealand was mixed in type, and several lines were selected by the Crop Research Division which differed markedly, notably in maturity. The earliest, called Early Research, was very quick to mature, but of poor malting quality. Mid-Research is higher in quality, but is subject to lodging. This is now released as certified Research barley.

Laboratory tests on malting quality over several years have shown that the Scandinavian types are superior to Research in malting quality. None of the other Scandinavian varieties is superior to Kenia in malting quality.

OATS

Oat variety trials are directed mainly toward the discovery of a good milling oat variety which resists lodging. Milford, a new English introduction, which is short and stiff in the straw with good grain yield has been one of the most successful introductions into trial work in recent years. Its yield appears to be at least equal to that of Onwards. The grain is not as attractive as varieties like Onwards and Abundance, but preliminary tests show that it is likely to be acceptable for milling. Its greatest value lies in its ability to withstand lodging under conditions in which the standard varieties are badly lodged. Steel, a Swedish variety, appeared in Extension Division trials for the first time in 1953-54. It has some degree of resistance to lodging.

MAIZE

Trials continue to be carried out in Poverty Bay, the chief maize-producing area, and they are mainly concerned with the testing of double hybrid lines of maize of United States origin. Pfister 360, the main variety now grown, is a double hybrid. Trials in past years have revealed that certain lines have outyielded Pfister 360, sometimes by a considerable margin, but generally they have been much too late maturing to be considered as practicable replacements or have other practical disadvantages. Variety trials are continuing with many other hybrid maize varieties which appear likely to be of value under New Zealand conditions.

—K. COTTIER

* * * *

WHEAT PRODUCTION IN CANTERBURY

AN extensive sampling survey of wheat growing in the Canterbury Province was conducted to obtain estimates of the acreage of wheat grown on the various classes of land and to determine the standard practices of wheat growing associated with each land class. From a random sample of approximately 20 per cent., based on acreage, a response of 89 per cent. of useful returns was obtained for the years 1951-52 and 1952-53. The main aim of this survey was to obtain preliminary information for determining the cost of production of wheat.

Results showed that on light land 1 per cent. of farm acreage was devoted to wheat, with 5 per cent. on medium and heavy land. Medium and heavy land was used for 70 per cent. of the total amount of wheat grown. In most districts the most common place in the rotation for wheat is after grass or after a brassica crop after grass, but there are several local variations. The most common pattern for the preparation of the ground included both skim ploughing and deep ploughing followed by about three working-down operations.

—JEAN G. MILLER

Care of Livestock during September

Contributed by the Animal Research Division

FOR the first month or 6 weeks of life a lamb depends almost entirely on its mother's milk. Ewes are capable of producing more milk than a single lamb can drink in the early part of lactation.

CARE OF EWES WITH TWIN LAMBS

Twins, on the other hand, can soon drink all the milk which the ewe can produce. For this reason ewes with twin lambs should be drafted off and grazed together on good paddocks. Separation is most easily done immediately after lambing.

During the last 7 years well-reared heifers have out-produced their poorly reared mates by an average of 12lb. of fat in the first lactation when both groups were well fed after calving.

ROTATIONAL GRAZING OF CALVES

Frequent changes to good clean pasture are essential if calves are to be successfully reared. This rotational grazing avoids deaths in winter, eliminates the need for drenching against worms, and produces yearlings 100lb. heavier than those kept in the one paddock for weeks at a time. Articles giving full directions for rearing dairy stock appeared in the April, May, and June issues of the "Journal".

Autumn-saved pasture is almost equal to high-quality spring pasture as a milk-producing fodder. It should, therefore, be rationed to the milking cows to make it last until the spring feed comes away and hardens up. An electric fence is essential for efficient utilisation, enabling the pasture to be grazed in small breaks. Unless sufficient reserves of this pasture are available for full feeding, the remainder of the feed should be made up with silage. Make sure enough hay is retained to balance the lush spring growth.

FEEDING THE MILKING HERD

When the autumn-saved pasture is finished the herd should be rotated round the farm. Paddocks should be small enough to maintain a concentration of 20 to 30 cows per acre. If necessary, larger paddocks may be subdivided with the electric fence. The aim should be to graze pasture when it is 4 to 6in. high, as it is then at its most nutritious stage. Cows should not be kept for more than 1 or 2 days in the paddock. If necessary, cleaning up after them should be done with dry stock.

On farms where scabby mouth occurs each new crop of lambs should be vaccinated, and this is most conveniently done at marking. If lambs are not protected, they are liable to suffer a severe check, as the disease makes eating very painful. The vaccine gives very good protection if properly used. Care is necessary to keep the needle prong clear of grease, as if it becomes blocked, no vaccine is applied and lambs may still be susceptible. Ewes which have not previously been exposed to the disease should be vaccinated at the same time as the lambs.

VACCINATION AGAINST SCABBY MOUTH

To prevent coccidiosis in chickens it is necessary to keep them growing steadily. Any check is dangerous. Cleanliness is very important, as the disease spreads through the soiling of food by droppings. If an outbreak occurs, sulphamezathine or sulphaquinoxaline should be used in the drinking water. Full particulars of dosage may be obtained from the Department of Agriculture's Poultry Instructors.

COCCIDIOSIS IN POULTRY

Late-farrowed spring litters should receive special attention, as they will be approaching weaning age. Creep feeding is a very important factor in the production of heavy weaners, and best results will be obtained by having a supply of meal and milk always before the litter. Weaned pigs must be well fed, and if meal has been used before weaning, its use should be continued for at least a fortnight to avoid an after-weaning check. The meal ration will be reduced as the skimmed milk supply increases. It is preferable to feed weaners with meal up to half their daily rations and give the milk saved to the store pigs rather than feed meal to the older pigs at this stage.

CARE OF PIGS

After weaning sows should receive sufficient milk and meal to enable them to regain the weight lost during previous suckling. They should be hand-mated, and once safely in pig may be allowed to subsist on good pasture.

Mastitis is usually most prevalent in spring. Milk from all quarters should be carefully examined each day in a strip cup. If there is any abnormality, the quarter should be treated without delay, three tubes of penicillin cerate being used at 24-hour intervals. Prompt treatment at this time of the year will greatly reduce loss in production from light or dry quarters.

MASTITIS

The work carried out on X chick disease has shown it to be a form of vitamin E deficiency, possibly arising from the feeding of certain batches of wheat.

Poultry farmers in the areas affected in previous years are advised to add 5 per cent. wheat-germ meal to the chick mash as a precautionary measure.

X CHICK DISEASE

An article describing the results of the investigation carried out on this disease appeared in the September 1953 issue of the "Journal of Agriculture".

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during June and for the 11 months ended 30 June 1954, with comparative figures for the same month and 11-monthly period of 1952-53, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	Percentage Inc. or dec.
June 1954	482	35	517	—
June 1953	758	27	785	—
Increase or decrease ..	—276	+8	—268	—34.140
11 months ended 30/6/54	141,783	3,015	144,798	—
11 months ended 30/6/53	160,025	3,147	163,172	—
Increase or decrease ..	—18,242	—132	—18,374	—11.260

Butter in store at 30 June 1954 was 5637 tons

CHEESE

Period	White	Tons Coloured	Total	Percentage Inc. or dec.
June 1954	1,435	7	1,442	—
June 1953	1,801	—	1,801	—
Increase or decrease ..	—366	+7	—359	—19.933
11 months ended 30/6/54	99,023	226	99,249	—
11 months ended 30/6/53	103,283	140	103,423	—
Increase or decrease ..	—4,260	+86	—4,174	—4.036

Cheese in store at 30 June 1954 was 10,659 tons

If these figures are converted into butterfat equivalent, there is a decrease of 9.655 per cent. in butterfat graded for the 11 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Main Crop Potatoes

Seasonal Notes by the Extension Division

MOST farmers grow small areas of main crop potatoes for their own use. Early and thorough cultivation and the use of Certified seed and suitable fertilisers should be given just as much attention by the domestic as by the commercial producer.

CULTIVATION

COMMERCIAL potato crops are best grown on well-drained, friable, loamy soils as a first crop in the rotation. The deep tilth and frequent intercultivation required for maximum yields act as an excellent "breaking in" process for old grassland. Sometimes the crop follows swedes, a winter fallow after rape and turnips, or occasionally on heavier soil types a cereal such as wheat. When potatoes are to follow grass the area should be skim ploughed or hustled in autumn, deep ploughed in May-June, and overwintered with the furrow exposed to the disintegrating and mellowing action of rain and frost.

Subsequent spring cultivations should aim at deep, friable tilth, achieved by either cross ploughing or grubbing to the full depth of the original furrow. Though the tilth need not be as fine as for small seeds, cloddy ground should be worked down with roller, discs, and harrows. Where twitch is troublesome the land should be hustled frequently whenever weather permits and where twitch roots are excessive they should be carted off and burnt. T.C.A. at 25lb. to 50lb. per acre applied some weeks before planting and accompanied by prior and post-treatment cultivations is useful on exceedingly "twitchy" land.

When potatoes follow winter roots the land should be spring ploughed in August and top worked with discs and/or grubber and harrows. For potatoes after rape or wheat, the area should be deep ploughed in autumn, winter fallowed, and subsequently disced or grubbed and harrowed. On friable lighter soil types ploughing may be unnecessary unless the ground is exceptionally weedy.

Post-planting cultivations should consist essentially of tine harrowing—in the direction of the rows and preferably with worn tines—10 to 14 days after planting, followed by at least two deep grubbings at 7- to 10-day intervals. A half mould is given 2 to 3 weeks before the shaws will cover the inter-row spaces and a full mould some 10 days later. The final moulding should leave a broad, crested ridge neither flat nor hollow on top. A good ridge prevents greening of tubers and guards against potato moth attacks and tuber infection by blight spores.

VARIETIES

Favoured commercial varieties may be grouped according to the time taken to reach maturity as follows:—

First early: Epicure and Cliffs Kidney.

Second early: Arran Pilot, Chippewa, Katahdin, and Jersey Bennes.

Early main crop: Arran Banner, Aucklander Short Top, Majestic, King Edward, and Arran Consul.

Late main crop: Aucklander Tall Top, Arran Chief, Inverness Favourite, Iron Duke, Dakota, Glen Ilam, and Sebago.

The earliest mature in 12 to 14 weeks, the second earliest and early main crop varieties in 16 to 18 weeks, and late varieties take up to 24 weeks. Epicure, Katahdin, and Chippewa do best on medium to heavy silt loams. Aucklander Short Top is adaptable to a wide range of soil and climatic conditions and is the most popular main crop variety. The high-yielding Arran Banner, though not a true early variety, is widely grown as such. It should be confined to sandy loams or light to medium silt loams. On the heavier soils its tubers tend to become excessively large, coarse, and hollow hearted.

Arran Chief, King Edward, and Jersey Bennes succeed on heavy silt loams in cool, moist climates. The late variety Dakota, an excellent keeper, yields heavily on good sandy loam; Iron Duke prefers heavier soil types. The two promising recent varieties Sebago and Glen Ilam do well on sandy loams and medium silt loams. Sebago is prone to hollow heart on heavy soils.

SEED

Certified seed preferably of 2oz. to 4oz. grade should be planted to ensure best results. Orders should be placed early and stored seed held under dry, cool, well-ventilated conditions. Before the potatoes are pitted or otherwise stored all obviously blight infected or mechanically and frost damaged tubers should be removed. Pits should be well drained, ventilated, and adequately covered with straw and earth. Seed potatoes may be stored alternatively in layers spread out in the dry under cover of trees or on a shed floor or woolshed gratings. They should not be exposed to direct sunlight. If it is necessary to leave them in sacks, they should be stacked in low tiers and examined at intervals for development of diseased or rotting tubers, which should be removed.

Pitted seed should be sorted over 3 to 4 weeks before planting and spread out to green and sprout under light, airy conditions. Where spreading is inconvenient the sacks of seed should be lined out along the headlands of the area to be planted. If this is done about 3 weeks before planting and the sacks are turned occasionally, the seed will green and sprout reasonably well. Diseased, badly damaged, and weak, spindly sprouted tubers should be rejected before planting.

PLANTING

In favoured, frost-free districts early crop planting may begin in July. Main crop planting occurs from September to mid-November, though the main planting will vary from district to district according to local climatic conditions and the risk of late frosts. Mechanical planting with 1- or 2-row planters is advisable for large areas, but small areas or crops on steeply sloping ground may be hand planted, the rows being opened with a ridging plough and the sets and fertiliser applied by hand and covered by splitting the ridges.

The sets should be planted 4in. to 6in. deep at 12in. to 18in. spacing in rows 28in. to 32in. apart. Early crops and those intended mainly for seed production should be planted at the closer spacings and main crops intended for table grades at the wider intervals. Varieties tending to produce exceedingly large, coarse, hollow-hearted tubers should be close spaced. If uniformity of spacing is to be achieved, planting should not be done too quickly. With a 2-row planter 4 acres per day is a reasonable speed.

FERTILISERS

Numerous experiments over many seasons and a wide range of soil and climatic conditions have shown that a 3 to 1 mixture of superphosphate and sulphate of ammonia will give an average yield increase of 21 per cent. over plots receiving no fertiliser. This mixture at 3cwt. to 4cwt. per acre has become standard practice for main crops. On highly fertile soils, where excess nitrogen causes excessive top growth and delayed maturity, sulphate of ammonia may be omitted or reduced in proportion by using a 5 or 6 to 1 mixture applied at 5cwt. to 6cwt. per acre. A 50-50 mixture of superphosphate and blood and bone may prove advantageous for main crops on land of medium fertility. Heavy rates up to 10cwt. per acre can prove profitable for early crops or main crops in very favoured districts with heavy yielding land. Applying the fertiliser in the rows along with the seed gives the best results. In blight districts spraying with copper fungicides should be started before the seasonal onset of disease and should be repeated at fortnightly intervals.

—M. MUSGRAVE

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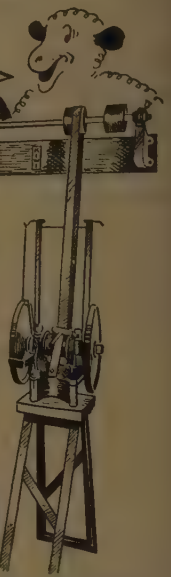

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Commercial Bean Culture in Auckland District

THE bean belongs to one of the most important families of economic plants. Besides being one of the most popular vegetables the bean is a leguminous plant and has the power of secreting nitrogen from the air and so increasing the fertility of the soil. It is therefore one of the best crops to grow in market gardens for crop rotation, as it replenishes nitrogen taken from the soil by other vegetable crops. The culture of different varieties of beans by commercial growers in Auckland district and the methods of controlling various diseases are described in this article by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

THE climate of the Auckland district is very suitable for the production of beans and large acreages of both broad and French beans are grown annually. The average yields per acre are 4 tons for broad beans, 4 tons for runner climber, and 2½ tons for dwarf.

The bean is an abundant cropper and a fairly rich soil is needed to produce heavy yields. Well-drained soils are desirable, but those likely to dry out in summer should be avoided, as the plant requires a plentiful supply of moisture during the hot months. The lighter types of soil produce best during spring and early summer, and quite good crops are grown in summer and autumn on the heavier, free-working soils. The moisture-holding capacity of the soil may be improved by the addition of animal manure, compost, or green crops.

Preparation of Land

Beans are often grown after crops of cabbages, cauliflowers, beetroot, parsnips, or potatoes to provide a change in crop rotation. A week or so before seeding is done the land should be deep ploughed and then, by the use of discs and harrow, worked down to a fairly fine tilth to facilitate the covering of the seed and to enable the seed planter to operate freely on it.

Manuring

It is often unnecessary to apply fertilisers before seeding, as generally where the previous crop has been liberally manured no further application is required for a bean crop. If the area has not previously been manured, equal parts of blood and bone and superphosphate plus 5 per cent. of sulphate of potash should be applied. This mixture is usually broadcast over the area at ½ ton per acre and worked into the soil during the final harrowing.

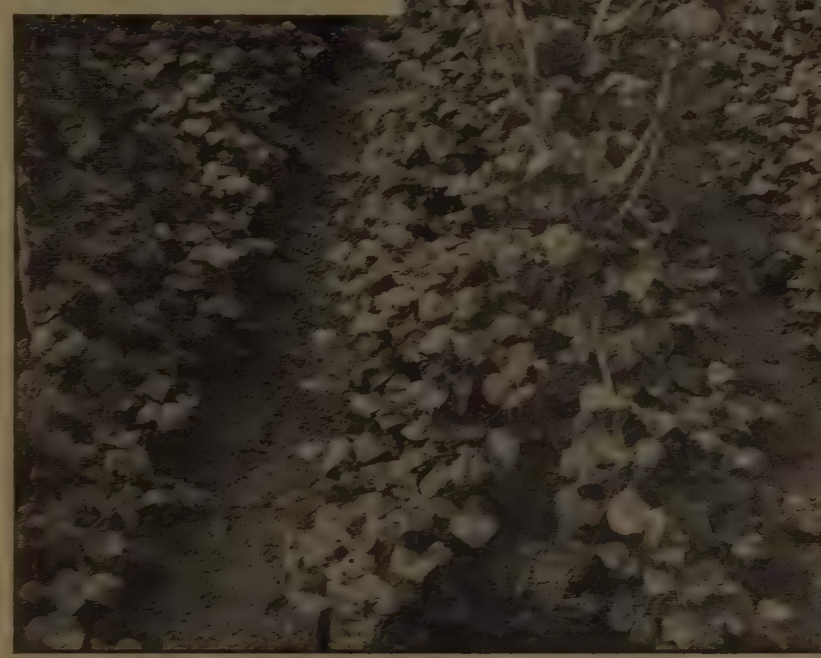
Fertilisers should not be applied in direct contact with the seed, as they may cause injury.

Lime

Beans, like most other leguminous crops, will tolerate fairly acid soils, but grow best on slightly acid soils. Extremely acid soils should be avoided. Most New Zealand soils should be limed at ½ ton to 1 ton of carbonate of lime per acre, but heavier dressings will be required where initial acidity is high, for example, where the pH is below 5.5. Lime should be applied and worked into the soil several weeks before seed is sown.

Broad Beans

The broad bean (*Vicia faba* L.) is one of the oldest members of this group of leguminous plants. It does best in the cooler months of the year and is usually sown from mid-April to the end of June, though May is the month preferred by most growers. Broad beans take about 14 to 16 weeks from planting to the beginning of harvest. They are easy to grow, and most varieties can be relied on to produce a good crop with a minimum of attention. May sowings usually mature when green vegetables are scarce and meet a good demand. Beans sown before May do not necessarily yield pods earlier than those sown later, for, though the plants may make good growth in late summer, they are likely to be checked, particularly when early spring weather is severe, and the earliest flowers may fail to set because of cold, wet conditions or sudden extreme temperature changes.



[Sparrow

A field of climber beans at the flowering stage showing prospects of a heavy yield.

Varieties

The varieties most commonly grown in Auckland are Early Long Pod (Leviathan) and Exhibition Long Pod. These produce pods up to 9in. long well filled with beans.

Method of Sowing

Seeds are usually sown about 2in. deep at 6in. intervals in rows 4ft. apart. Early sowings in heavy soils should be made on low ridges. About 1 bushel of seed is required for 1 acre.

Cultural Practices

During the early growth of the crop cultivation is frequent enough to suppress weed growth and to aerate the soil. About a month after sowing, when the plants are about 12in. high, the soil is moulded up to the plants to help support them. If the plants are not growing satisfactorily, a side dressing of fertiliser can be applied before this moulding. The fertiliser mixture previously recommended should be sown down each side of the plant rows at 10cwt. per acre. To induce lateral growth and encourage further flowering the top of each stem may be pinched out when the first flowers appear.

Harvesting

Broad beans are grown for their edible seed and are usually shelled

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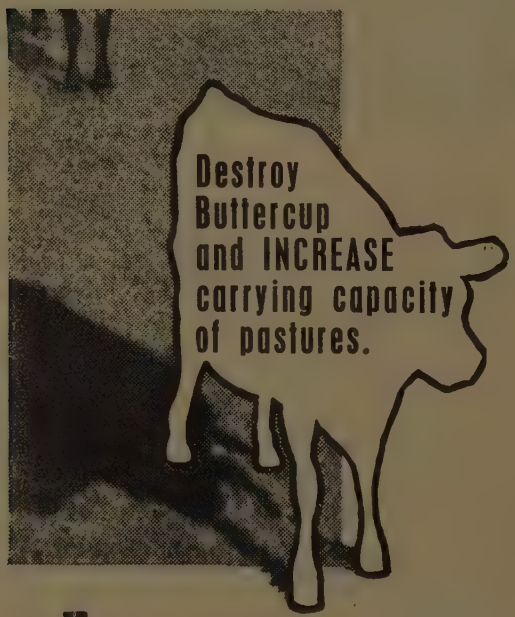

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[*Sparrow*

Planting beans with a mechanical planter. Seeds are usually sown about 2in. deep at 6in. intervals in rows 4ft. apart.

like peas before being cooked. Nevertheless, when broad beans are very young and tender the whole pods may be cut up, cooked, and eaten in the same manner as french beans. Usually they are harvested when the pods are well filled with sizeable seeds, a stage of maturity indicated by the plumpness and firmness of the seed sacs. Harvesting is usually done once a week and should be regular, for if the pods are allowed to mature fully, flowering ceases and the bearing period of the plant is shortened.

French Beans

French beans (*Phaseolus vulgaris* L.) can be divided into two groups—climbing and dwarf. The most popular commercially grown climbing varieties of french beans are annuals, as are the dwarfs, and should be distinguished from the runner bean (*Phaseolus multiflorus*), which is a perennial and is not grown commercially to any great extent in the North Island. All of these types are frost tender and distinctly different from the broad bean, as they will not grow in cold weather. Plantings of french beans usually begin in August and extend until the end of February for the dwarf varieties, and from September to the end of January for the climbers. The dwarfs require about 10 weeks to mature and the climbers about 12 weeks. Except for the early plantings, beans are not difficult to grow, but, as with most crops, disease and pest control is important for successful production.

Varieties

Extensive breeding work has led to the development of stringless varieties of french beans. The term stringless is applied to certain bean varieties which do not develop string at the normal harvesting stage. Almost all french beans become stringy if left on the plants too long.

Dwarf Varieties

Dwarf varieties, although grown to some extent throughout the season, are mainly planted for the production of early or very late crops. The following is a description of the favoured dwarf varieties:—

Pale Dun, although not a stringless bean, is a heavy cropper with medium length, flat, fleshy pods. This variety is very hardy and is suitable for sowing much earlier than most other varieties.

The Prince is a stringless, heavy yielding bean bearing thick, fleshy pods up to 9in. long. It is a good variety for early main crop or late plantings.

Masterpiece is a good cropper with long, straight, stringless pods. It is suitable for early, main crop, or late plantings.

Black Valentine is heavy bearing. The pods are about 7in. long and are dark green and stringless. It is a good variety for second early or main crop.

Tendergreen is very productive; it has stringless pods 6in. long, nearly straight, dark green, round, and fleshy. This variety is very suitable as a canning bean.

Climbing Varieties

Fardenlosa is the staked variety most favoured by commercial growers. It is a bean of exceptional merit and is a heavy cropper, bearing straight, fleshy, tender, stringless beans 8 to 10in. long.

Market Wonder is also commonly grown and is similar in most respects to Fardenlosa, except that the pods are slightly shorter. Both these varieties take about 75 days to mature.

[*Sparrow*

A 2-row mechanical planter, showing one of the two cylinders for holding the seeds, with the depth shear (A) and seed delivery hopper (B) below. The arm with the disc blade in the foreground is for marking a guide row for the tractor to follow on the return trip. The planter has one of these on each side, one only being operated, depending on the direction the machine is travelling.

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[*Sparrow*

A crop of climber beans which were sown with a seed planter and have received their first cultivation. Note the closeness of cultivation. Rows are slightly ridged.

Westralia, not at present a standard variety in New Zealand, is a rust-resistant variety recently released by the Department of Agriculture of Western Australia. It was developed from a natural cross between the variety Golden Harvest and a rust-resistant white-seeded strain of Kentucky Wonder and incorporates many of the desirable features of both parents. It is somewhat similar to Market Wonder in seed colour, cropping, and size and shape of pods.

In recent trials in Auckland this variety has proved to be highly resistant to the strains of bean rust present in that district. Because of its disease resistance it may become popular with commercial growers, especially as a late crop in areas where rust has proved a factor limiting profitable production in the past.

Seed Saving

Although most of the seed of dwarf varieties and a large percentage of the seed of climbing varieties are procured from seedsmen each year, many growers prefer to save their own, especially from the climbing variety Fardenlosa. For seed the crop is sown in late October so that it will mature in February, when the weather is usually fine and favourable for ripening. The pods are allowed to ripen fully on the vine and during harvesting any pods showing signs of disease are discarded. After further drying in the sun for a few days the beans are threshed in sacks by being flailed with sticks. Before the extracted seed is stored it is sorted over by hand to remove any which are damaged or stained.

Method of Sowing

Beans may be planted either on ridges or on the flat, the former method being recommended for wet soils. It is customary to draw drills 2½ to 3in. deep and 4in. wide and scatter the seed so that they fall 3 to 4in. apart. The drills are spaced to suit the requirements of the cultivating implements, usually 30in. to 32in. apart for dwarf varieties and 32in. to 36in. for climbers. About 60lb. of seed is required to plant 1 acre. Several of the large Auckland market gardens use mechanical seeders to sow the beans. This implement is attached to the tractor and sows and covers the seed at a regulated spacing and depth in one operation. Most of the machines sow two rows at the same time.

The climbing varieties, which grow to a height of about 7ft., require supports. It is usual to mould the bean rows up into wide ridges about 8in. high and 12in. wide at the base as soon as the plants are showing signs of developing tendrils and before supports are placed in position. The supports used are usually manuka stakes about 7 to 8ft. long and about ¾ to 1in. in diameter. The rows are paired off and the stakes, in groups of six, are placed three on one row and three on the other with their bases 18in. apart on the outside of each row about 1in. out from the plants. The six stakes are drawn together at the top and securely tied (see lower right illustration on page 171). The space between each group of stakes is 9in.

Cultural Practices

Fairly frequent cultivation to suppress weeds and to aerate the soil is necessary.

As the dwarf varieties grow the soil is gradually moulded up to help support them; when they begin to develop flowers the final cultivation is given with a moulding machine which leaves the ridges about the same height as for potatoes. In moulding, care must be taken not to cover the foliage of the plant. The final moulding only builds up the sides of the already formed ridge.

With the climbers the soil is moulded up before the support stakes are placed in position, and the ridge is sustained during inter-row cultivation. With the main crop and the late crop, which grow more vigorously under the more favourable weather conditions, it is good practice to retard the growth of the runners by pinching off the tops when they are 2ft. high and again when they have grown to 4ft. This will cause the plant to develop fruit-bearing laterals closer to the base and will generally increase its yield.

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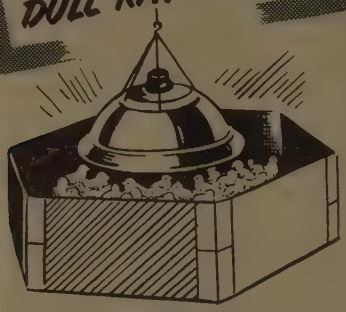

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Harvesting

French beans are harvested before they are fully mature and as soon as they have grown to a suitable size, that is, before seeds develop full size and begin to harden. If pods are picked when they are too young, some bulk is lost; the pods will quickly become unattractive and difficult to prepare for cooking. Harvesting should be at weekly or shorter intervals, usually three to four pickings being necessary for dwarf varieties and up to 10 for climbing varieties.

For local markets the beans are packed neatly crosswise in bushel cases which hold about 30lb. of beans. These containers are usually not lidded. In the early and late parts of the season, when beans are not so plentiful, and for transport for long distances the flat tomato case package D (12 x 16 x 4½in. deep) is used. This holds 12lb. of beans. This case is lidded and usually the net weight is branded on one end.

In commercial practice bean crops are sprayed.

Disease and Pest Control

Brief descriptions of the main diseases and insect pests of broad and french beans and control measures are given here.

Broad Beans

Chocolate spot (*Botrytis cinerea*) is a fungous disease commonly found on bean crops. Severe infection will considerably reduce the yield and may kill the plants. The disease is usually prevalent in spring and early summer, appearing as chocolate-coloured spots up to ¼in. or more in diameter. The spots are more numerous on the upper surfaces of the leaves and may be either superficial or penetrate to the lower surface. There may be streaks several inches long on the stems, and on the leaf stalks similar streaks may cause complete collapse of the leaf. The pods may also show brownish blemishes and affected flowers will not set.

Treatment: The disease is less likely to be serious if the plants are vigorous and the ground is well supplied with potash and phosphates. Adequate drainage is very important in preventing the disease. Beans should not be sown too thickly or in positions which are too sheltered. Regular spraying at 14-day intervals with Bordeaux mixture 3 : 4 : 50 or with a certified copper compound or with "Thiro" spray 4 : 100 will reduce the incidence of the disease.

[*Sparrow*

Portion of a field of seed beans, showing plants almost defoliated and with ripe seed pods ready to be harvested.

[*Sparrow*

Above—The stage of growth of the crop when supporting sticks are placed, and showing the height and width of the ridges. Right—Method of supporting the plants. The rows are staked in pairs, with six stakes (three on each row) placed at regular intervals and drawn together and tied at the top.

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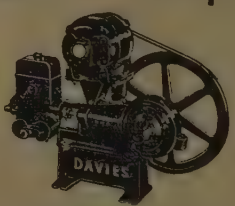

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Rust (*Uromyces fabae*) is a common disease of broad beans, but usually appears too late to cause any appreciable loss of crops. It appears as small, numerous, reddish pustules on the undersides of the leaves and in severe infection the leaves may die or the green leaf tissue may be so reduced that the plant is not able to manufacture sufficient food for good development and yields.

Treatment: Before the disease reaches serious proportions the plants should be sprayed at 14-day intervals with lime sulphur 1 : 150 plus colloidal sulphur (40 per cent.) 2lb. : 100.

Black aphis (*Aphis craccivora*): Young, tender shoots become infested with colonies of tiny, black, shining insects a little smaller than the head of a pin which cause wilting of the leaves and stunting of growth.

Treatment: When the insects appear the plants should be sprayed with 40 per cent. nicotine sulphate, that is, 1½ pints plus 3lb. of soft soap to each 100 gallons of water (1 : 600) or with H.E.T.P. at 1 pint in 100 gallons of water, or T.E.P.P. at ½ pint to 100 gallons of water.

Root aphis (*Trifidaphis phaseoli*) are greyish-yellow globular, mealy insects about the size of a pinhead. They attach themselves to the roots of bean plants and feed on the sap, causing the foliage to turn yellow. Severe attacks may cause wilting of the foliage followed by deaths of the plants.

Treatment: The soil in the plant rows should be watered with nicotine sulphate at 1½ pints in 100 gallons of water to which 3lb. of soft soap to each 100 gallons is added.

French Beans

Anthracnose (*Colletotrichum lindemuthianum*) is perhaps the most serious of french bean diseases. It is generally prevalent during wet, cool weather and, if not controlled, may cause complete loss of the crop. It is common in most districts and infection is more likely to occur during autumn. It affects the stems, leaves, and pods. On the stems it forms long, dark brown, sunken cankers which may cause withering of the upper leaves. Leaf infection is followed by parts of the veins on the under surface of the leaves becoming reddish brown; neighbouring parts of the leaves may shrivel. On the pods small reddish spots are the first signs of infection; these become enlarged to circular depressions bordered with dark brown. The fungus often passes through the pods and attacks the seeds, producing dark spots on light-coloured seeds and less prominent markings on dark ones.

[*Department of Scientific and Industrial Research*

Chocolate spot on broad bean leaves.

Treatment: The white-seeded varieties are highly resistant to anthracnose. As the disease may be carried on the seed, it is important that only clean seed be used. The disease may be controlled by spraying every 14 days with Bordeaux mixture 3 : 4 : 50 or with a certified copper compound.

Halo blight (*Pseudomonas phaseolicola*) is a bacterial disease which is often a serious trouble, particularly from October to March. Early infection checks the plants and reduces yields considerably. Affected plants show semi-transparent, water-soaked spots about ⅛in. across on the leaves, the spots being surrounded by a yellowish halo. Severe infection of the stems may be followed by wilting and death of the plants. Infection of the pods results in circular, water-soaked spots that gradually enlarge, forming irregular blotches with margins varying from amber yellow to almost brick red. The bacteria often ooze from the centre of the spots and show as a greasy, yellow slime which forms a yellowish crust on the surface as it dries. In severe cases the bacteria penetrate the pods and attack the seeds, usually causing small, irregular, yellow spots or blotches. The whole seed may become shrivelled and yellow.

[*Department of Scientific and Industrial Research*

Rust on broad bean leaves.

White-seeded varieties are highly resistant to halo blight.

Treatment: As the disease can be carried on the seed, only clean seed should be used. Seed showing characteristic yellow stains should be destroyed. Diseased plants should be removed and destroyed as soon as they are noticed. A protective spray as recommended for anthracnose should be applied from the time the beans are through the ground.

Root rot (*Fusarium* spp.): This is a soil-borne fungus which attacks the roots of beans and causes them to rot. The fungus causes sunken, reddish-brown lesions at the base of the stem, which then shrinks and causes the leaves to turn yellow and bean pods to shrivel. The roots of affected plants are scanty and reddish. Young plants seldom survive an attack.

[*Department of Scientific and Industrial Research*

Anthracnose on french bean plant, showing partial defoliation of plant and circular sunken areas on pods.

Treatment: The disease is very difficult to control. Crop rotation should be practised to avoid possible contamination carried over in the soil from a previous, infected crop. Affected plants should be pulled up and burnt. Seed treatment such as dusting with "Spergon" at ¼lb. of dust per 100lb. of seed may discourage early infection of seeds and seedlings. The seed should be shaken with the dust in a closed container until it is completely covered, when any excess dust can be removed.

Bean rust (*Uromyces appendiculatus* (Pers.) Fr.) mainly affects french bean crops during March and April. It first appears as reddish spots on the under surfaces of the leaves. The spots later become so numerous that they almost cover the leaf surface and the leaves then fall prematurely or dry up on the plant. Early infection checks the plants and considerably reduces yields.

Treatment: Spraying the plants as soon as the infection is noticed as for control of rust of broad beans will control this fungus.

Grey mould (*Botrytis cinerea*) can be very destructive on french bean crops during wet and humid weather, especially if the foliage is dense. It attacks both foliage and pods, appearing as a greyish-brown, furry mould. The fungus can spread rapidly and sometimes will completely kill the plant.

Treatment: Spraying the plants as soon as the first infection is seen with 50 per cent. thiram at concentration of 2lb. in 100 gallons of water will help to control this disease.

Sclerotinia (*Sclerotinia sclerotiorum*) can be troublesome in areas where the fungus exists in the soil. The stems

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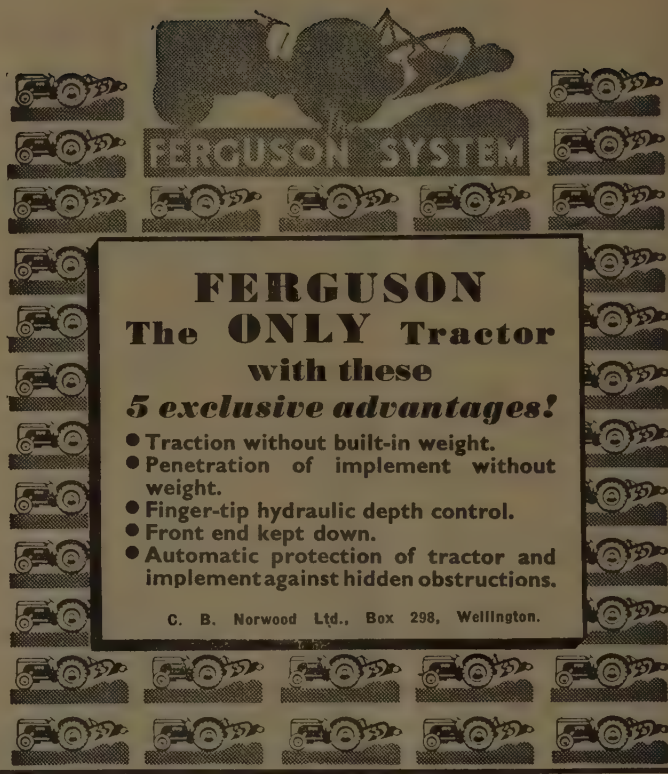

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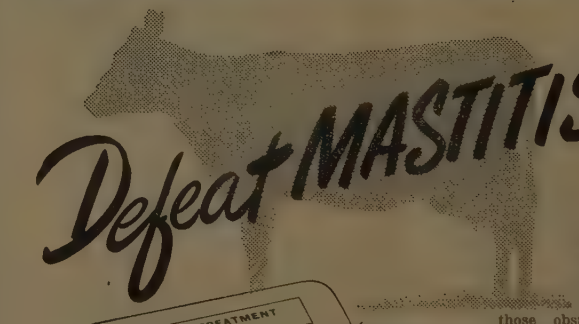

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of infected plants become soft and watery and later large, black, resting bodies (sclerotia) develop. These can live in the soil until the next season. The disease will also attack the pods, especially those in contact with the soil. Beans harvested from infected areas become rotten overnight or during transit.

Treatment: This disease is very difficult to control and except for treating the soil with steam or with a soil disinfectant such as chloropicrin or formalin, which is costly, no practical control is known. In highly infected areas crop rotation should be the first consideration and susceptible crops such as beans, carrots, parsnips, lettuces, tomatoes, beetroot, cucumbers, and lupins should not be planted for a number of years.

Green vegetable bug (*Nezara viridula*): This bug sucks sap from foliage and pods, causing the young pods to turn yellow and shrivel and older pods to become tough and leathery. The adult is winged, but appears to fly very seldom, and then only for a short distance. When disturbed, the bugs frequently drop to the ground. Adults are leaf-green, almost shield shaped, and ½ to ⅝in. long. They lay from 40 to 80 eggs in clusters on the foliage. The eggs are pale yellow at first, but soon change to reddish brown. The bug which emerges from the egg is 1/16in. long and a bright orange colour with many dark spots. During their life bugs undergo five changes in developments and colour, but until they reach the adult stage the dominant colour is black. They hibernate in the adult stage.

[*Department of Scientific and Industrial Research*

Halo blight on bean foliage. Upper—Foliage with semi-transparent, water-soaked spots about ⅛in. across, each surrounded by a wide yellow halo. Lower—The same infection at a later stage.

[*Department of Scientific and Industrial Research*

Halo blight on bean pods. The circular, water-soaked spots gradually enlarge and form irregular blotches.

Treatment: When the bugs are seen the plants should be sprayed with H.E.T.P. at 1 pint in 100 gallons of water or with T.E.P.P. at ½ pint in 100 gallons of water.

Caterpillars: The so-called looper caterpillar (*Plusia chalcites*) is the most common of a number of species of caterpillars that damage the foliage of bean plants. They are up to 1½in. long and have a characteristic looping action when in motion.

Treatment: For the control of various caterpillars which attack beans D.D.T. sprays or dusts may be used. For spraying, 1lb. of a 50 per cent. D.D.T. wettable powder in 100 gallons of water is recommended. For dusting, a 2 per cent. D.D.T. powder will be found satisfactory. However, although the above controls are more lasting in their effect, they have the disadvantage of possible harmful residue, and therefore a more volatile spray should be used, especially when the beans are being harvested. Those recommended are H.E.T.P. at 1 pint in 100 gallons of water, and T.E.P.P. at half the strength of H.E.T.P.

Red spider (*Tetranychus* sp.): The undersides of the leaves become infested with numerous small, red mites which live on the plant sap and cause the foliage to turn yellow. A heavy infestation will cause leaf curling and may result in the leaves drying up and falling off; the plant will become stunted and will produce little or no crop.

Treatment: Plants should be sprayed with H.E.T.P. or T.E.P.P. as indicated for looper caterpillar. Two applications at 10-day intervals are usually necessary for complete control, with possible further sprays if the crop becomes reinfested.

Black aphis and root aphis: The description and control are the same as given for these pests on broad beans.

Bean weevil (*Bruchus obtectus*) mainly affects dried beans in storage. The adult lays its eggs (which are whitish), in groups of 12 or more in the young bean pods along the seam or even on the seed itself, by boring through the pod. When the egg hatches the grub bores into the bean and the small hole by which it enters often heals over. When fully grown the grub eats a tunnel almost to the surface, leaving only a film of skin, and then goes into the chrysalis stage. When the adult weevil emerges it cuts through this film and lays eggs on nearby beans and the cycle is continued. Under warm conditions there are several generations, so an ordinary slight infestation can be built up to considerable proportions if the beans are stored for a long time.

Treatment: When beans are grown for seed the plants should be sprayed from the podding stage to harvest at 14-day intervals with a 50 per cent. D.D.T. wettable powder at 1lb. in 100 gallons of water. The seed can be treated with copper oxychloride dust at 1lb. to 100lb. of seed. For small quantities it is usual to shake the seed with the necessary dust in a closed container so that the seed becomes completely covered. Any excess dust can be removed. If the seed is required for food, the weevil can be killed by placing the seed in cold water, heating the water to a temperature of 140 degrees F., and then drying the seed as quickly as possible.

Precautions with Chemicals

The following precautions should be observed when using nicotine sulphate, H.E.T.P., or T.E.P.P.:—

1. Avoid contact of the concentrate with the skin or mouth and use rubber gloves if hands have open cuts.
2. Immediately wash off concentrate which has been spilt on the skin, using soap and running water. After spraying clean all exposed parts in a similar manner.
3. Keep insecticides out of reach of children.
4. Do not eat, drink, or smoke while spraying.
5. If inhalation of spray vapour causes headaches and tightness of the chest, the spraying area should be vacated.

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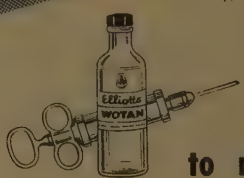

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Horsepower of Tractors and Tractor Tests

THERE seems to be a great deal of misconception of the term horsepower as applied to farm tractors. The misunderstanding arises generally from the fact that the term horsepower can be, and is, used in a variety of ways. The increasing use of machinery on farms, particularly tractors and engine-functioned implements, has brought the term horsepower into almost everyday use. This article by C. M. B. Olivecrona, Machinery Instructor, Department of Agriculture, Wellington, points out some of the pitfalls in the use of the word horsepower without qualification, because of its very wide application in the mechanical field.

HORSEPOWER is a term that originated in England and was first used in connection with water wheels and steam engines. Because the first steam engines were used to drive pumps and mills that had been previously worked by horses, the word horsepower became the term adopted to express the work output of the new machines. Experiments were carried out and it was found that a strong horse travelling at 2½ miles per hour could raise a weight of 150lb. while pulling on a long rope that passed over a pulley. This was equivalent to raising 33,000lb. 1ft. in 1 minute.

Since that time the figure of 33,000 foot-pounds of work in 1 minute has become the accepted standard for mechanical horsepower in the English-speaking world and in many other countries.

To enable a better understanding of the term horsepower as used in modern engineering parlance and test data some fundamentals of the term should be known; and similarly, some idea of the computation and interpretation of tractor test data will be useful.

Power is the rate of doing work and is usually measured in foot-pounds per minute or per second.

Work is defined as force acting through a distance and is also measured in foot pounds in the English system.

The word horsepower is embodied in many terms all of which have special application in the mechanical field.

Some of these terms are as follows:—

Indicated horsepower (i.h.p.) is the power calculated from an engine indicator card and represents the power available from the fuel at the piston; it is equal to:

$$\frac{P.L.A.N.n.}{33,000 \times 2}$$

where

P = mean effective pressure in lb. per square inch.

L = length of stroke in feet.

A = area of piston in square inches.

N = number of revolutions per minute.

n = number of cylinders.

In 4-cycle engines the denominator 2 is used because there is only one power stroke for every two revolutions. For 2-cycle engines the 2 would not be used, as there is one power stroke for each cylinder each revolution.

The term indicated horsepower is used in technical practice when the power of internal combustion engines is being considered and has a value when the full power output of an engine is under observation.

Other horsepower terms used in tractor test data are:—

Brake horsepower (b.h.p.) is the power delivered by the crankshaft of the engine and available for useful work. It can be called developed horsepower.

Belt horsepower (bl.h.p.) is the power of an engine measured at the end of a suitable belt; it is usually a little less than brake horsepower and is used in most modern tractor tests.

Drawbar horsepower (db.h.p.) is the power of a tractor measured at the drawbar; it is power available to draw loads or pull machines.

Rated drawbar horsepower is taken to be 75 per cent. of maximum drawbar horsepower.

Rated belt or brake horsepower is taken to be 85 per cent. of maximum belt or brake horsepower.

Observed horsepower is the power obtained from a dynamometer reading without any correction for atmospheric temperature or pressure.

Corrected horsepower is the observed horsepower corrected to conditions at sea level and 60 degrees F. temperature. Sea level is taken to be a barometric pressure of 29.92in.

Maximum brake horsepower is the maximum power that an engine will develop at a specific speed with the throttle fully open. A tractor engine's maximum power is always measured at rated speed. The rated speed is the number of revolutions recommended by the manufacturer for normal operation. This should be remembered when tests of engines of cars are compared with those of tractors. Whereas the car engine's maximum output is taken to be the point where the power curve shows no increase for increased engine speed, the tractor engine is measured at rated revolution of crankshaft with full throttle. The difference is, of course, that a tractor engine can be worked at maximum power for considerable periods, but a car engine would not be likely to withstand the stress of maximum output for very long. A reputable tractor should be able to operate at maximum brake horsepower almost continuously.

Horsepower hour is 1 h.p. working for 1 hour and is equal to 1,980,000 foot-pounds of work.

The foregoing are only some of the terms that have the word horsepower incorporated in them, but it can be seen from them how the term can quite easily be misconstrued.

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Factors Affecting Horsepower Output

There are some factors that influence the horsepower output of a tractor or an engine in an adverse manner; they absorb power but give no return of useful work. Some of the factors are:—

Friction

The principal power-absorbing factor is friction and in engineering parlance is referred to as friction horsepower.

Friction horsepower is the power required to overcome the internal friction in the engine, such as that of the bearings and the pistons and rings against the cylinder walls. It is measured usually with a dynamometer while the engine is motored or driven by some outside source of power.

Pumping losses: Besides the power that is required to overcome friction some is also absorbed for what is known as pumping or the drawing in and compressing of the fuel charge and exhausting the burnt gases, etc.

Accessories: Power is also required to drive accessories such as the fan, generator, valves, and oil pump.

The power required to overcome friction, pumping losses, and to drive the accessories could be called the **total friction horsepower** or power losses. It would be the power required to run the engine without the production of useful work.

Altitude and Air Temperature

Altitude has a direct effect on the power output of all internal combustion engines, and the power loss due to elevation is taken to be approximately 4 per cent. for every 1000ft. above 330ft—little effect is noticed from sea level to 330ft., but from the latter point elevation becomes a factor in the accurate computation of horsepower.

The temperature of the atmosphere can also affect engine performance, though perhaps not quite as markedly as altitude. Experiments have shown that approximately 1 per cent. decrease in power can be expected for every 5 degrees rise above 65 degrees F. in air temperature.

Rolling Resistance

Rolling resistance will not be discussed separately here, but can be taken as the resistance of the tractor to motion which must be overcome and which also absorbs power.

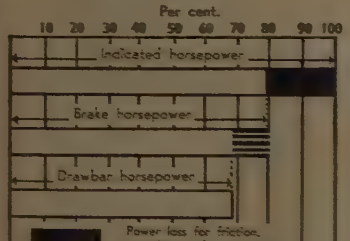
Per cent.
10 20 30 40 50 60 70 80 90 100
Indicated horsepower
Brake horsepower
Drawbar horsepower
Power loss for friction, pumping, and accessories
Power loss for transmission and rolling resistance

Fig. 1—Percentage of power available at drawbar of an average tractor (average of results from 24 machines).

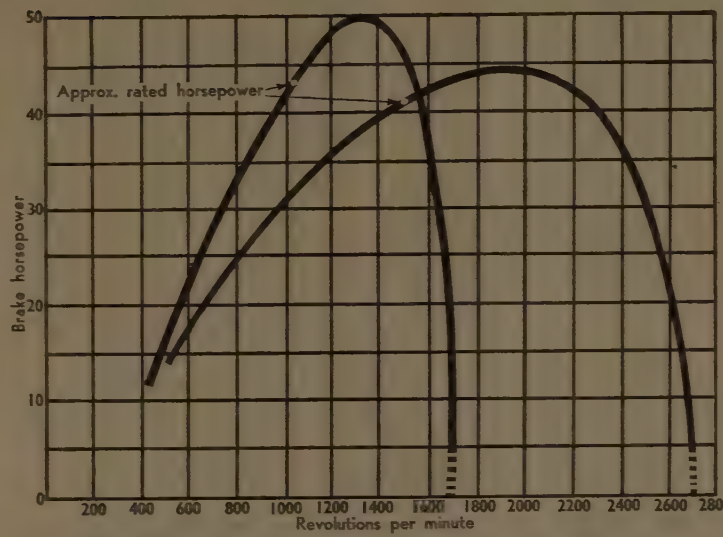

Fig. 2—Effect of engine speed on brake horsepower. The two power curves shown on the graph are for different types of engines that have been selected to show the increase and decrease of power with speed.

How Engine Power is Used

Fig. 1 shows what happens to the full power of the engine and how much of it is available at the drawbar of the average tractor.

Only a portion of the power developed at the head of the piston is ultimately available for useful work at the drawbar. The amount of power available will depend on the mechanical efficiency of the engine and on the efficiency of the transmission. An engine of high mechanical efficiency will not absorb as much friction horsepower as one with low mechanical efficiency, and the friction horsepower absorbed by a highly efficient transmission system will be much less than that used by a system of low efficiency. Following is an explanation of the term mechanical efficiency and its relationship to both brake horsepower and friction horsepower.

Mechanical Efficiency

The ratio $\frac{\text{b.h.p.}}{\text{i.h.p.}}$ is known as the mechanical efficiency of the engine and is usually expressed as a percentage. An engine with high mechanical efficiency would have low power losses and an engine with low mechanical efficiency would have high power losses.

The difference in horsepower between indicated horsepower and brake horsepower would be equal to the total friction horsepower or the power losses of the engine. Mechanical efficiency is almost directly proportionate to the friction horsepower absorbed. There is also quite an appreciable difference between brake horsepower and drawbar horsepower in the average tractor. This is because the transmission system absorbs power in the process of transferring the power of the engine to the drive wheels. Power is also required to overcome the rolling resistance of the tractor as it moves forward and the necessary amount is absorbed by the transmission, also at the expense of drawbar horsepower. An efficient transmission system will absorb a minimum of power and consequently a greater portion of the brake horsepower will be available at the drawbar for useful work.

Speed and Horsepower

Because of loose use of the term horsepower the fact that speed is an integral factor in the term is often lost sight of. This factor of speed cannot be eliminated or ignored, because as was pointed out earlier, power is the rate of doing work and is measured in foot-pounds per minute or per second. Fig. 2 shows this and it can be seen that though an engine or a tractor may have a certain output at a given speed, the same machine will yield more or less power as the speed is varied. Generally an increase in speed gives an increase in power as shown in Fig. 2. For various reasons there is a limit to which speed can be increased to gain power, and most manufacturers keep speeds of their engines well within these limits to ensure long life and to reduce upkeep to a minimum.

Speed is an essential factor when horsepower is considered and where comparisons are made between one machine and another. For instance, one engine could quite easily have a power output of 20 b.h.p. at 1000 revolutions per minute, 25 b.h.p. at 1500 r.p.m., and 30 b.h.p. at 2000 r.p.m.

The simple explanation of this is that the engine in working faster will raise the required number of foot-pounds in less time. It is possible to have two identical engines with different horsepower ratings merely because they are working at different speeds. The correct way to state the brake or belt horsepower of an engine is so

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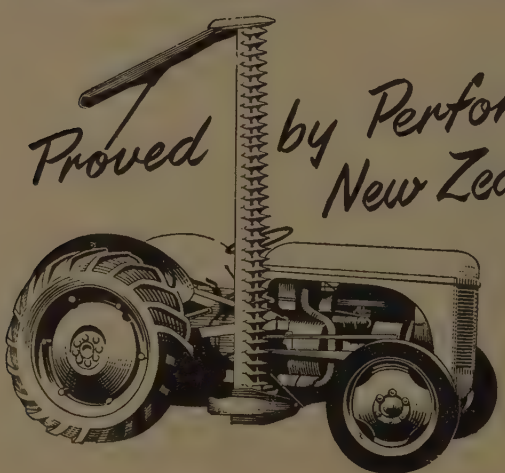

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Speed and Drawbar Horsepower

Drawbar horsepower is affected by speed in the same way as brake or belt horsepower, but if anything the effect of speed is greater on drawbar horsepower. Fig. 3 show the effects of speed on drawbar horsepower. Here again the reason for difference is merely the fact that a specified amount of work is accomplished in more or less time.

The computation of drawbar horsepower has as its basis the same factor

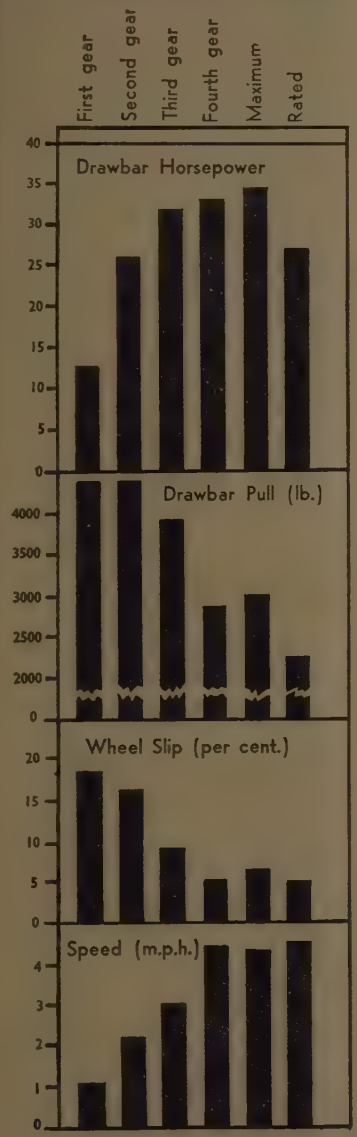

Fig. 3—These graphs show how speed can influence drawbar horsepower output. (Data were taken from a tractor test sheet.)

BELT HORSEPOWER TESTS

HP	CRANK SHAFT SPEED RPM	FUEL CONSUMPTION: GALS. PER HOUR	FUEL CONSUMPTION: HP HRS PER GAL	FUEL CONSUMPTION: LBS PER HP HOUR	WATER USED GAL PER HOUR	TEMP DEG F: COOLING MEDIUM	TEMP DEG F: AIR	BAROMETER INCHES OF MERCURY
TEST B—100% MAXIMUM LOAD TEST. TWO HOURS								
34.82	1447	2.800	12.44	0.557	0.00	197	81	28.950
TEST C—OPERATING MAXIMUM LOAD. ONE HOUR								
34.16	1452	2.733	12.50	0.554	0.00	196	82	28.870
***TEST D—ONE HOUR**								
31.38	1450	2.580	12.16	0.570	0.00	201	82	28.870
TEST E—VARYING LOAD. TWO HOURS (20 MINUTE RUNS) LAST LINE IS AVERAGE.								
31 42	1456	2.589	12.14	0.571	---	200	81	-----
7 48	1536	1.078	1.37	5.047	---	206	78	-----
16.45	1513	1.835	8.96	0.773	---	201	77	-----
33 02	1433	2.623	12.59	0.551	---	197	76	-----
8 32	1530	1 407	5.91	1.172	---	203	74	-----
23 78	1477	2 195	10.83	0.640	---	197	75	-----
19.08	1491	1.955	9.76	0.710	0.00	201	77	28.890

DRAWBAR HORSEPOWER TESTS

HP	DRAW BAR PULL POUNDS	SPEED MILES PER HOUR	CRANK SHAFT SPEED RPM	SLIP ON DRIVE WHEELS %	FUEL CONSUMPTION: GALS PER HOUR	FUEL CONSUMPTION: HP HRS PER GAL	FUEL CONSUMPTION: LBS PER HP HOUR	WATER USED GAL PER HOUR	TEMP DEG F: COOLING MEDIUM	TEMP DEG F: AIR	BAROMETER INCHES OF MERCURY
TEST F—100% MAXIMUM LOAD.								Second GEAR.			
30.62	3653	3.14	1452	7.87	-----Not Recorded-----				194	92	28.735
TEST G—OPERATING MAXIMUM LOAD.											
25 49	4365	2 19	1458	14.89	-----	(1st Gear)	-----		193	94	28 870
30.36	3634	3 13	1453	8.21	-----	(2nd Gear)	-----		194	93	28 880
30.52	2951	3.88	1453	7.01	-----	(3rd Gear)	-----		192	9[illegible]	28 740
30.65	2396	4.80	1450	5.03	-----	(4th Gear)	-----		192	96	28.730
***TEST H—TEN HOURS.**								Second GEAR.			
24.89	2941	3.17	1450	6.80	2.769	8.99	0.771	0.019	190	94	28.865

Fig. 4—A Nebraska test sheet.

as all other horsepowers, namely, 33,000 foot-pounds of work in 1 minute. The method of calculation in a hypothetical case is as follows:—

A tractor is able to exert an effort of 4000lb. pull at 2 m.p.h. or 176ft. per minute; therefore the tractor is doing 696,000 foot-pounds per minute; this divided by 33,000 gives 21.3 db.h.p. approximately.

$$\text{Drawbar horsepower} = \frac{\text{lb. pull} \times \text{speed (feet per minute)}}{33{,}000}$$

The same machine could possibly give a pull of 3000lb. at 4 m.p.h. which would, by the same formula, work out to 32 db.h.p. From the foregoing it can be seen that the same tractor could have a different drawbar horsepower rating at various speeds. Fig. 3 was taken from a Nebraska test sheet selected to give an example of different drawbar horsepower figures for different speeds of the same machine.

Some manufacturers state the power output of their machines in two specific speeds, both governed. In these instances the brake and drawbar horsepowers are given for the two engine speeds.

Tractor Tests

Tractor performance is measured by certain tests, perhaps the most widely known of which is the Nebraska test, carried out by the Agricultural Experiment Station of the University of Nebraska's Agricultural College, U.S.A. This test was instituted by the State of Nebraska in 1919 to protect tractor users and to encourage the manufacture and sale of improved types of tractors.

The law required a stock tractor of each model to be submitted to a board of three engineers for testing and for the results of these tests to be compared with the claims made by the manufacturers. Manufacturers and dealers were bound by certain legal requirements. The test was so successful in helping to establish the merits of the more sound products that it came to be accepted in the other states of the U.S.A. and in Canada as the yardstick of tractor performance. The law was revised in 1937 and the test procedure as laid down by the Society of Agricultural Engineers and the Society of Automotive Engineers in the U.S.A. is now used.

The law required among other things that a service station with a full supply of parts should be established within reasonable distance of customers. There are three principal tractor-testing authorities, Nebraska, U.S.A.; N.I.A.E. (National Institute of Agricultural Engineering), Britain; and the Department of Supply, Melbourne, Australia. All their tests are now so similar that a direct comparison can be made of tractor performance whether machines are tested in America, Great Britain, or Australia.

The data recorded in the extract from the Nebraska test sheet (Fig. 4) indicate the thoroughness of tractor testing. From this particular test the following summary can be arrived at:—

	Drawbar	Belt
1. Observed maximum horsepower	30.62	34.82
2. Corrected horsepower (calculated from above figures and adjusted to 60 degrees F. air temperature and 29.92in. of atmospheric pressure) ..	32.86	36.70
3. Rated horsepower (75 per cent. of calculated maximum drawbar horsepower and 85 per cent. of calculated maximum belt horsepower)	24.65	31.20

The corrected figures for both belt and drawbar horsepower are higher than those given anywhere else on the test sheet, because the air temperature was above the standard figure of 60 degrees F. and the barometric pressure was below the sea level figure of 29.92in. of mercury. The actual figures in this case, 81 degrees F. and 28.950in. of mercury, can be seen in the last two columns of the sheet. These differences of 21 degrees in air temperature and .970in. of atmospheric pressure make a difference of 1.88 h.p. on the maximum belt test. In the drawbar horsepower test (maximum) a similar difference can be seen, and the last two columns again show the air temperature and barometric pressure as above and below standard figures, giving a horsepower difference in this case of 2.24.

The low atmospheric pressure in this case indicates that the University of Nebraska is fairly high above sea level.

It will be noticed from the test sheet that the various tests through which the tractor is put are indicated by letters of the alphabet. Very briefly the letters indicate the following:—

A (not on sheet reproduced). Limber up: This is seldom included in test data sheets; usually 10 to 12 hours' running is permitted to remove stiffness and to allow manufacturers to make minor adjustments.

B. 100 per cent. maximum belt: To establish a rating for belt horsepower, figures from this test are converted to standard conditions and 85 per cent. is taken to represent the operating rating. The engine is run at rated revolutions per minute for 2 hours.

C. Operating maximum belt test: This permits manufacturers to select the most suitable carburettor setting for operating and to obtain maximum power and the fuel consumption at this setting. A series of 20- to 30-minute runs are made at rated r.p.m. and 1 hour at selected setting with throttle wide open.

D. Rated load belt: This establishes the tractor's ability to carry the 85 per cent. of maximum corrected load at the selected carburettor setting. The test is for 1 hour.

E. Varying load belt: This shows governor control at varying loads and fuel consumption. A series of 20-minute runs is made at loads that vary from no load to maximum rated load.

F. 100 per cent. maximum drawbar: This establishes drawbar horsepower rating. Figures from this test are converted to standard conditions and 75 per cent. is taken to represent operating rating. There are two or more 500ft. runs.

G. Operating maximum drawbar: This gives maximum horsepower in each speed under the conditions prevailing all the time. Two or more runs of 500ft. in each forward gear are made.

H. Rated load drawbar: This is to determine if the tractor can pull the rated load continuously. This test is run for 10 hours with a 500ft. check taken each hour. The carburettor setting is the same as that used in test G.

Tests J and K (not included in test sheet reproduced) were instituted in 1941 to apply to rubber tyred tractors only. The tests are made with alternative sized tyres fully weighted and unweighted.

Each of these tests has an object, and the conditions under which they shall be run are laid down and followed very strictly. The duration of each test, the items measured, and the adjustments allowed or required are similarly laid down and followed. Important points relating to tractor tests and horsepower comparisons are:—

A test is made on one tractor of a standard model, and though reasonable care is taken to see that it is a fair representative of its make and model, it could vary very slightly from another machine of the same model. The big manufacturers of tractors are more likely to underrate than to overrate their products.

Tractor Models

All tractors with the same nominal model are not necessarily of the same exact pattern and there may be a small difference in their horsepower. The reason is that the manufacturers have found that when a certain model is popular it pays to retain the model and number for machines manufactured later. Thus two machines of the same model (but produced in different years) could have different horsepower ratings. A well-known American machine of the same model and number had the following horsepower ratings in different years:—

	Test number	Db.h.p.
1936	256	91.75
1940	357	110
1949	415	131.2

The only way to make certain that machines are identical is to compare the mechanical specifications and serial numbers and to note the number of the test quoted. Of course this applies only to machines of the same make and in most cases the year of manufacture is a sufficiently reliable guide.

In the comparison of tractors not of the same make, the following are important points:—

1. Brake horsepower cannot be compared directly with drawbar horsepower.
2. Belt horsepower cannot be compared with drawbar horsepower.
3. Belt horsepower and brake horsepower are sufficiently close to one another for an approximate comparison, but belt horsepower rating is always a little lower than brake horsepower rating.
4. Maximum and rated horsepower cannot be compared with one another either with belt, brake, or drawbar horsepower.
5. Speed is important in all horsepower ratings.

The soundest method of assessing the power of a tractor on the drawbar is to take the rated drawbar horsepower, where available, because this is the manufacturer's recommendation for the best use of his product. Where comparisons are made between makes or models differences in horsepower definitions should be taken into account.

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Sweet Peas Are Not Difficult Flowers to Grow Well

SWEET peas are not difficult to grow and with a little extra care it is possible to produce really good blooms on long, straight stems. This article by M. Joanna Lockie, Horticultural Instructor, Department of Agriculture, Auckland, discusses some of the points in growing sweet peas which may make the difference between a good or mediocre flower crop.

SWEET peas have advanced tremendously during the last 50 years and are now far removed from the original small-flowered wild pea of Mediterranean countries. It is now common for well-grown sweet peas to carry four large flowers on an 18in. stem, but more recent improvements include a type known as multiflora sweet peas, carrying six or seven flowers per stem. At the other end of the scale there is the dwarf sweet pea, which grows as a small bush 9in. to 1ft. high and which will be a useful annual for bedding schemes.

The ideal position for sweet peas is out in the open garden away from the almost traditional situations of house walls, verandas, and wooden fences. For healthy, vigorous growth sweet peas require a fertile free-draining soil in full sun and where there will be free circulation of air.

Sweet peas grown against house walls and fences often suffer from drying out at the roots, due to the shielding effect of their support. This drying out may give rise to a condition where the buds drop before they open. Also, in very sheltered spots mildew is frequently found attacking sweet peas, and naturally the display from plants suffering an attack of mildew is not as good as that from healthy plants.

Sweet peas grown in draughty areas or in the shade of trees cannot do their best.

Cold weather and frost do not harm sweet peas, though growth is delayed until soil conditions and temperature are more favourable. For early establishment a sunny sheltered position is essential.

Where sweet peas are grown annually it is advisable to rotate the planting round the garden so that they do not grow for longer than 3 consecutive years in one place. A new site should always be used if the previous season's plants died before reaching maturity, or if their roots were found to be unhealthy when the spent vines were removed.

Preparation of Soil

Thorough preparation of the soil is essential if large flowers on strong stems are to be produced for the full flowering season; otherwise the quality of the blooms deteriorates as the season advances.

To enable the plants to develop a vigorous root system and to encourage them to send their roots over a large area deep digging should be carried out in conjunction with incorporating compost or well-rotted farmyard manure into the soil.

[*Photo News*

Digging to a depth of 2 spits and mixing the compost thoroughly into the lower spit should be sufficient. If the compost is put on in a layer or left lumpy, the roots tend to concentrate in the layer and not to explore further. More widely dispersed roots are better able to cope with dry conditions in summer.

If compost or farmyard manure is not available, a dressing of the flower border fertiliser mixture of 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate or muriate of potash at 2oz. per square yard will improve the soil fertility.

Once the digging is completed a dressing of agricultural lime at 4oz. per square yard can be dusted over the area and lightly worked in.

In heavy clay soils, where deep digging may create a drainage sump for surrounding ground, a channel should be dug from the site at the same depth or deeper to prevent waterlogging. As sweet peas do not thrive in loose soil, preparations for them should be made some weeks before planting or sowing. The soil should be firmed as digging and working in of organic matter progress. The surface should be left loose so that aeration and absorption of rain will not be impeded.

Staking

Well-grown sweet peas will grow 7ft. to 8ft. high. The mass of foliage and stems creates quite a wind resistance and, when wet, becomes fairly heavy. Whatever the method of staking employed, it must be strong and capable of taking the strain. There are few things so disheartening as to

[*Sparrow*

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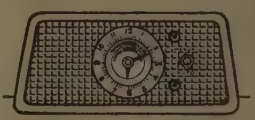

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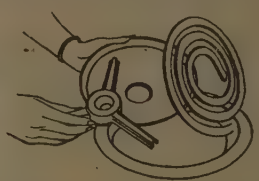

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lose a row of flowering sweet peas when the supports collapse during a storm.

The method of staking illustrated on this page, using bamboo canes, is most satisfactory; once the plants start to grow twine should be run along the outside of the rows at 2ft. to 3ft. intervals to hold the vines in. Where manuka brush is plentiful it may be used in place of the bamboo by threading it through three or more horizontal wires.

Sweet peas grown against a wall or in front of a veranda may be trained up wires or twine or wire netting may be used.

Where sweet peas are to be grown in the open border among perennials a tripod of stakes or brush may be erected and a few twists of twine should be wound round the lower 2ft. of the tripod to give the young plants sufficient support during the initial stages.

Raising Plants

Sweet peas are raised from seed sown either directly into position or in pots or boxes for later transplanting.

When seed is bought it should be remembered that a little extra cost for good seed is offset by better results. Many seedsmen sell packets containing several smaller packets of named varieties. Sow each variety separately, and make a note of its name and performance so that varieties which do well under local conditions may be grown again.

Because it has a hard coat sweet pea seed is slow to germinate and often the seeds are nicked with a sharp knife or soaked before planting. Chipping the seed, taking care not to damage the growing point of the seed, is more satisfactory than soaking. With soaked seed there is always the possibility that soil conditions will not be favourable at the time of planting and so the seed is killed by fungus attack, rots, or dries out. As a precaution against fungus damage seed may be dusted with one of the certified copper spray compounds or materials containing thiram.

Seed sown in position should be set about ¼in. deep and 2in. apart and can be thinned later, though the depredations of slugs and birds usually bring about sufficient reduction in numbers. Black cotton stretched about 1½in. above the row of seed may prevent some bird damage. Metaldehyde mixed with bran and placed on tin lids or pieces of board or even ringed round the plants once germination takes place is used to combat slug damage. This mixture needs renewing after rain.

Seed sown in boxes should be ¼in. deep and 1½in. apart to allow ample space to remove the young plants, each with a ball of soil about its roots. Deep boxes should always be used.

Transplanted sweet peas in many instances give a disappointing strike, but if the seed box is watered a few hours before lifting the plants and roots are damaged as little as possible, they should establish readily.

Time of Sowing

Times for sowing vary according to district and prevailing soil conditions. The seed of winter-flowering types may be sown in position in January, February, or March, so that it germinates before the ground becomes too cold and wet. These plants should flower during late winter.

Alternatively, if late autumn-early winter is too cold and wet for seed sowing, seed of summer-flowering types may be sown in spring, during August or September, for summer flowers.

Where the spring sowing has to be delayed because of cold wet soil, seed may be raised in pots or deep boxes in a sheltered position outdoors or in a frame and transplanted during September, or as soon as soil conditions improve.

Maintenance

Once the plants reach a height of 3in. to 4in. they should have access to some support; otherwise they bend back and sometimes break, with the result that the injuries may permit entry of disease to the stems.

If the lower edge of the support is too high, the intermediate gap may be filled with brush or twigs and pieces from a hedge to provide the initial support so necessary during the plant's early stages.

Watering should be carried out if the soil becomes dry. A thorough soaking to allow the water to penetrate the full depth of the roots is preferable to several light sprinklings, when the top inch or two is moistened, and the root area remains dry. During watering, the foliage should be kept dry to reduce the risk of mildew spores gaining a hold on the damp foliage.

Liquid manuring may be carried out after the plants have been flowering for a month to maintain the quality of bloom. Liquid manure must be applied only to damp ground and, if necessary, the soil should be watered with the hose beforehand. A bag containing farmyard manure may be soaked in water for a few days and the liquid drawn off and diluted with water. As an alternative a mixture of 3 parts of sulphate of ammonia, 6 parts of superphosphate, and 3 parts of sulphate of potash may be broadcast and worked into the soil.

Any fertiliser mixture given should be applied to the full area covered by 18in. each side of the row and not heaped up round the stems. When the plant is ready for extra feeding the roots will have travelled well away from the base of the stem.

[*Sparrow*

Method of staking used in illustration below. Substantial posts 5ft. above ground carry a top wire to which strong bamboo canes are tied. Each cane is pushed firmly into the ground before it is pulled over and tied to the top wire.

[*Sparrow*

Sweet peas growing in Auckland. The rows run north and south and flower production is equal in quality and quantity on both sides of the row.

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2.2C

Mulching with lawn clippings or compost while the soil is still moist will help to keep roots cool and conserve moisture.

To keep flower production high, spent flowers must be removed and certainly not left on long enough to set seed. Once this happens flower production falls off rapidly. If other conditions are favourable, the secret of a long blooming season is to cut and keep cutting sweet pea flowers.

The best stage to cut for cut flowers is when one or two flowers are open and the younger ones are still in bud. If the seed pod is showing between the petals of the oldest flowers, they will not last much longer than a day in water, and if the young buds are too tight, they will not unfold after cutting.

Some varieties fade or scorch in the sun, and strong wind can have a similar burning effect, but though this spoils the general appearance in the garden, it is usually possible to find sufficient unblemished flowers for cutting. A little sun scorch is better than the detrimental effects of excessive shade.

Pests and Diseases

Good healthy growth induced by having the plants in a position which suits them and by paying attention to cultural details is the best precaution against disease.

Aphides

Aphides can be controlled by spraying with 40 per cent. nicotine sulphate at 1 fl. oz. to 4 gallons of water to which 2oz. of soft soap has been added. (The soap should not be used if the nicotine is combined with another spray material.)

Mildew

Mildew is not usually troublesome unless plants are in a shady or sheltered position. It shows as a powdery whiteness on the leaves and weakens the plants considerably. Flowers of sulphur dusted on to the leaves while they are damp after a morning dew will help to check it.

[*Sparrow*

Though these sweet peas have strong, straight stems, they carry only one or two flowers to a stem. Such vigorous vines should carry heads of three and four flowers.

Every attention has been paid to ensuring that these sweet peas have adequate support. But unfortunately an attack of mildew has lessened the growth produced and reduced the display.

Slugs and Snails

Metaldehyde crushed and mixed with bran has the effect of paralysing the slugs, which are then left exposed to birds or dried out in the sun. Effective prepared baits are available.

Bud Drop

Dropping of unopened buds may be due to one or more physiological factors such as extreme fluctuations of moisture, draughts, waterlogging, excessive fertiliser applications, or unseasonable weather changes. Careful attention to cultural details should do away with conditions likely to cause this trouble.

References: J. P. Hudson, "Journal of Agriculture", December 1947; "Sweet Peas", E. R. Janes; "Carnations and Sweet Peas", E. O. Petersen; "Horticultural Exhibitors Manual", A. G. L. Hellyer.

Work for September

Roses

All rose pruning should now be completed and the beds given a mulch of well-decayed farmyard manure or compost, care being taken that the mulch does not touch the trunks of the bushes. Lawn clippings make a satisfactory mulch for roses and help to conserve moisture during summer.

Gladioli

The main planting season for gladioli is from September to October. Successive plantings at fortnightly intervals will give a longer period when flowers are available. The first planting may be made now, but, in colder districts, a warm sunny situation sheltered from strong wind should be chosen. In northern districts earlier plantings are successful.

A suitable fertiliser mixture which can be worked into the soil before planting is 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate or muriate of potash at 2oz. per square yard.

As there are several diseases which are carried through on the corm, the husks should be removed and corms inspected. Badly diseased corms should be burnt. Where a favourite variety is affected it is often possible to cut out the diseased area with a sharp knife and dust the wound with flowers of sulphur or powdered charcoal. As a precaution against fungus attack corms should be dipped just before planting in one of the mercuric preparations sold for that purpose.

In light soil gladioli can be planted 6in. to 8in. deep, but in heavier soil or where drainage is not so free 3in. is sufficient. In exposed positions stakes should be put in at the time of planting.

With all later plantings it is advisable to dust the corms with D.D.T. to kill any thrips which may be overwintering on them.

Fuchsias and Hydrangeas

Where fuchsia and hydrangea shrubs have not been pruned, it can be done now. With fuchsia cut out all weak and spindly growth and cut back the long branches to develop a compact bush. As the young shoots develop they can be pinched back after about the third pair of leaves to encourage further branching.

Hydrangea stems which flowered should be cut back to a vigorous pair of buds. Stems which did not flower should be left uncut, as they usually carry the flower buds already formed in the terminal shoot. All small, weak growths arising from the base of the plant should be cut out. Too heavy a cutting back of a hydrangea may

cause it to throw a tremendous amount of growth, but little or no flower.

Where hydrangea colours are pale and washed out an improvement may be made by giving the soil around pink bushes a dressing of lime at 4oz. per square yard. To improve blue bushes aluminium sulphate at 1 teaspoon to a gallon of water may be watered around the roots, care being taken to see that the soil is wet before the dressing is given.

Two hydrangeas of an extra good red are Heinrich Seidal, with fringed petals, and Parsival with serrated petals.

Dahlias

Any dahlia tubers which break into growth in storage may be planted out immediately danger of frost is over, or cuttings of 3in. may be taken from the tuber once the growths have reached that length. Such cuttings are trimmed with a straight cut close to the tuber and inserted in sand in a frame or glasshouse. When rooted they may be planted out in the border in the ordinary way. Dahlias raised from cuttings in this manner are perfectly satisfactory.

Chrysanthemums

Chrysanthemums may be increased by lifting and dividing established plants when the new shoots develop, the outer shoots being used, as they are the most vigorous. This method is satisfactory where the chrysanthemum is healthy, but unfortunately chrysanthemums are very subject to eelworm, which causes the lower leaves to turn brown and shrivel, leaving a poor, small flower head above the scorched leaves. The only way to combat eelworm is either to burn affected plants and certainly not replant in the same area or to treat the chrysanthemum stools with hot water. To do this it is necessary to steep the whole stool in water held at a temperature of 110 degrees F. for 20 minutes, and then replant in fresh soil. Chrysanthemums may also be increased from cuttings. Young growths of 3in. to 4in. are trimmed just below a leaf, the lower leaves cut off, and the prepared cutting set in sand in a cool frame or glasshouse, or they can be rooted outside in a warm, well drained bed which receives a little shade.

Sweet Peas

Sweet peas may be sown in a warm, sunny, sheltered bed during this month, or if preferred, seed may be sown in pots for later transplanting. Box raising of sweet peas is not so satisfactory because they have a long root which is difficult to get out of the box without injury, and if this happens the plant receives a severe setback.

Annuals

Seeds of hardy annuals such as calendula, dianthus, godetia, candytuft, marigold, and clarkia may be sown outside in positions in the garden where soil and climatic conditions are favourable. Until temperatures begin to rise sowing in beds outside should be done only where drainage is free and the position warm and sheltered; otherwise it is better to delay sowing or sow in boxes which can be placed in a sheltered position outside and covered if necessary. These plants will then be ready to plant out as soon as conditions improve.

Seedlings of cineraria and *Primula malacoides* which have naturalised are usually robust plants and worth keeping for their colour, though their flowers may be small. Where they have come up in a cool shady border they are better left alone. If necessary, however, they can be transplanted to a more satisfactory position.

Shrubs

During September sub-tropical and evergreen shrubs may still be planted. As danger of frost is passing, it is now safe in districts where they can be grown to plant out such plants as *Solanum wendlandi*, luculia, poinsettia, tibouchina, as well as ornamental conifers and camellias. Evergreen trees do not become completely dormant during winter; moving them in the dead of winter gives a greater shock to them than movement now. When they are in more active growth and in the more favourable growing conditions of spring they can start straight into growth in their new position. As they are still growing, these plants are sold with a ball of soil attached to their roots. If when a plant arrives the ball is dry, it should be soaked in a bucket of water before being opened. If it is not convenient to plant immediately, it should be set in the ground so that the ball is completely covered.

The hole for planting should be large enough to take the roots outspread; when the hole is ready the sacking should be removed and the roots trimmed or straightened without unnecessarily disturbing the soil. It is not a good plan to leave the sacking round the roots, but sometimes new young roots come through, in which case the bulky top portion of sacking only should be cut away. The sacking often hides damaged or crooked roots which cannot be corrected without opening the ball.

Olearia cheesemani

THE delicately scented New Zealand daisy bush *Olearia cheesemani* pictured above is one of the choicest and most spectacular of white flowering shrubs in cultivation.

By the second half of October this plant is completely smothered with blossom for from 2 to 3 weeks. The plant begins to flower when it is only about 18in. high.

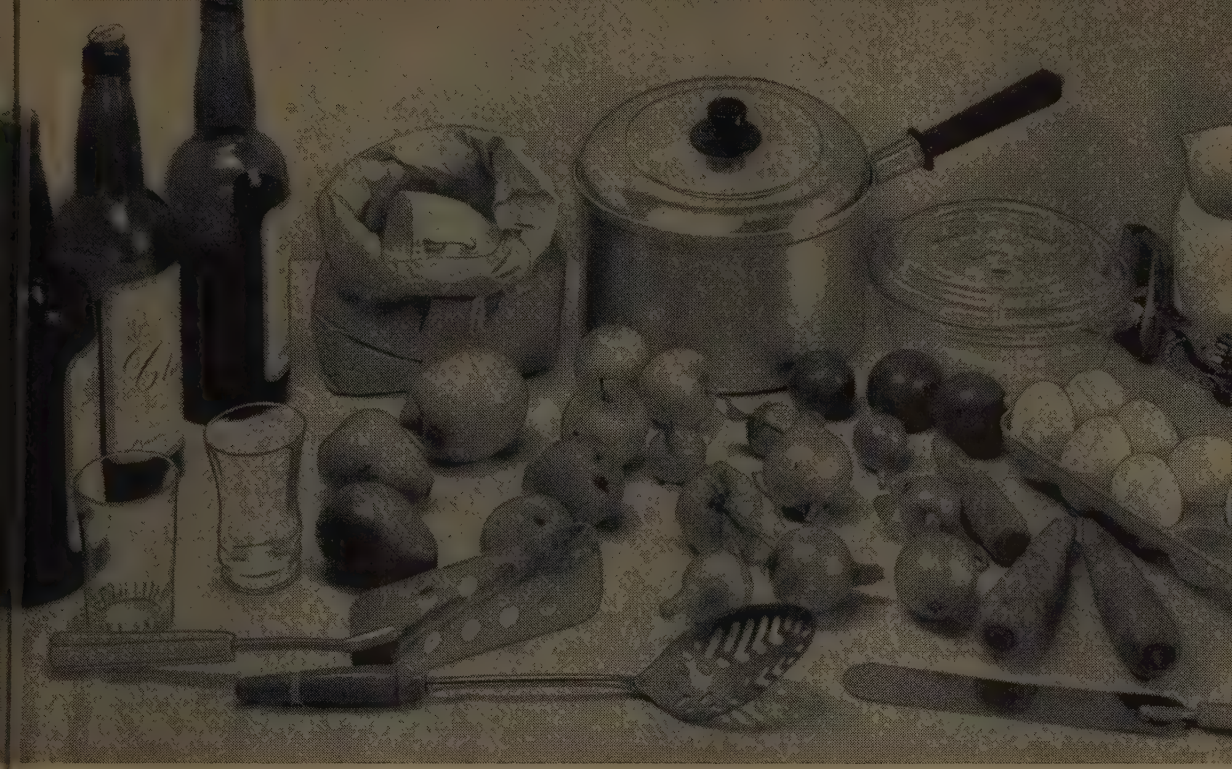
Olearia cheesemani has neat, tidy foliage and is a striking subject for a lawn, being a symmetrical, round-topped bush which eventually reaches 5ft. in height. It can also be used as a lovely background for a rock garden.

The shrub shown in the photograph was grown in the Otari Plant Museum, Wellington, from a plant collected in the Ohinemuri Gorge; wild plants are also found in the Otaki Gorge and at Lake Waikaremoana.

The plant is sometimes listed by nurserymen as *Olearia arborescens* var. *angustifolia*.

Propagation: Seed should be sown under glass in pots or boxes in sandy soil. Only plump seed should be selected and pressed into the top of the soil. The pots or boxes should be shaded with paper.

—*F. E. WILKIN, Horticultural Inspector, Department of Agriculture, Wellington.*



The Culinary Uses of Wine

THE time has passed when one could read a recipe containing the words "add a quart of good sherry" and contemplate making the dish. Such recipes are curiosities now, but the idea of wine as a flavouring should not be lightly dismissed. The addition of wine as a flavour to a dish can add piquancy and interest to the most ordinary food, and in this article Nell Macpherson, formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland, gives a variety of recipes for savoury and sweet dishes in which wine is included.

UNTIL fairly recently wine was not extensively produced in New Zealand and its cost prohibited its use as a cooking ingredient. Wines, however, are becoming easier and cheaper to buy. The use of a little wine to flavour trifles has been an accepted custom, but very few cooks use it when making other dishes. This may be part of the British heritage, as, apart from special dishes for festivals, comparatively few recipes in English books contain wine, possibly because most wine had to be imported, which added to its cost. In Continental countries where wine is produced it has been used as a flavouring in the same way as spices and pepper. In fact its use is much older, as spices are comparatively recent discoveries in the history of cooking.

Wine is made by fermenting fruit juices, usually grape juice. During the fermentation chemical changes of the juice cause each different kind of wine to have a different flavour and aroma. When one is cooking with wine the colour of the wine must be considered as well as the flavour, as an unattractive colour can be given to some foods if a red instead of a white wine is used.

Cooking Methods

When wine is cooked the flavour and aroma only remain, as the alcohol is evaporated. Foods cooked in wine should be cooked slowly in a covered dish so that none of the flavour is lost. Generally dry wines combine well with meat, fish, and cheese dishes, and sweet wines combine well with fruits and puddings. Wine can also be used in the preparation of dishes of more delicately flavoured foods like mushrooms, but it does not combine well with egg dishes unless they are of the sweet or souffle type.

As the flavour takes some time to penetrate the food, it is better to marinate the food with wine, that is, leave the food to soak in the wine for 1 hour to 2 hours before cooking it, or for some meat dishes to use a long, slow method of cooking. In most of the recipes given in this article the wine is cooked with the food and cannot be detected as a separate flavour. Either red wines or white wines are suggested in the recipes and these may be further classified into dry or sweet wines.

White Wines

Dry	Sweet
Sherry	Sherry
Madeira	Marsala
Hock	Sauterne
Chablis	

Red Wines

Dry	Sweet
Claret	Port
Burgundy	Sparkling Burgundy

Soups

Many soups are improved by the addition of wine.

Potato Soup

1lb. of potatoes
1 quart of milk
2 wine-glasses of dry white wine
1 peeled onion stuck with 8 cloves
1½ pints of stock or water

Peel and dice the potatoes and cook in the stock until soft. Rub through a sieve and return the mixture to the saucepan. Add the onion and the milk. Cook slowly for 1 hour. Remove the onion and add the wine. Simmer for 3 minutes to 5 minutes, stirring carefully. Sprinkle with chopped chives and serve with croutons. (8 servings.)

Bean Soup

4oz. of haricot or butter beans
1oz. of flour
½oz. of butter
1½oz. of grated cheese
1 pint of stock or ½ pint of milk and ½ pint of water
1 wine-glass of dry white wine

Soak the beans overnight in enough water to cover them. Boil to a mash in the same water and mash with a fork. Brown the flour in the butter and stir the mixture into the beans. Add the stock and season to taste. Boil gently for 1 hour. Add the cheese and wine and stir in. Reheat just to boiling and serve immediately. (6 servings.)

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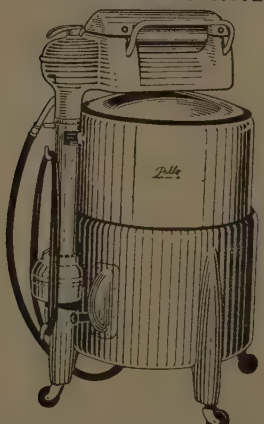

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Crayfish Soup

1 cupful of crayfish pieces (the less attractive pieces can be used for soup)
1 tablespoon of flour
1 pint of fish stock
1 wine-glass of dry red wine
Shake of cayenne pepper
2oz. of butter

Fry the crayfish lightly in the butter. Sprinkle the flour in and blend well. Add the stock. Bring to the boil and add the wine and pepper. **Do not** allow this soup to boil. (4 servings.) Any other flaked fish can be used in place of the crayfish.

A Quick Soup that is Different

6 teaspoons of meat or vegetable extract
1 tumbler of dry sherry or claret
2 tablespoons of flour
3 pints of boiling water
1 cup of cream or top milk

Dissolve the meat extract in the boiling water. Mix the flour to a paste with the cream and thicken the meat extract solution with it. Add the wine and simmer for 3 minutes to 5 minutes. (8 servings.) Preparation time 10 minutes. Less wine may be used if desired.

Meat Dishes

Kidneys in Wine

6 lamb kidneys
2 tablespoons of butter
½ cup of white wine
1 teaspoon of flour
½ teaspoon of salt

Wash the kidneys, split them, and remove the fat and the membrane. Slice the kidneys, place in a dish, and pour the wine over them. Allow to stand for ½ hour. Lift out the kidneys and allow to drain. Melt the butter in a frying pan and add the kidney slices and salt. Cook for 5 minutes while turning the slices gently. Sprinkle on the flour and stir it in. Add the wine and cook until the mixture thickens. (3 to 4 servings.) Liver can be cooked in the same way.

Baked Chops

1 loin chop per person
White wine
1 teaspoon of chopped onion per person

Place the chops in a deep oven dish and sprinkle with the chopped onion. Cover with white wine. Allow to stand for at least 1 hour. (The chops can be prepared in the morning to be cooked at night if desired.) Remove the chops and roll in seasoned flour. Brown them in a small amount of hot fat. Put back in the wine and bake in a moderate oven at 350 degrees F. for 45 minutes.

Meat Loaf

1lb. of minced beef
3oz. of rolled oats
½ cup of dry red wine
3 tablespoons of chopped onion
1½ teaspoons of salt
¼ teaspoon of pepper
1 egg, beaten
2 tablespoons of melted dripping

Combine all the ingredients. Pack the mixture firmly into a greased loaf tin and bake in a moderate oven at 350 degrees F. for 1 hour.

Chicken Salmis

Mixture 1

1 cooked fowl cut in pieces
2 tomatoes
3 tablespoons of claret
Parsley, thyme, and sage tied together
2 tablespoons of water
3 shallots

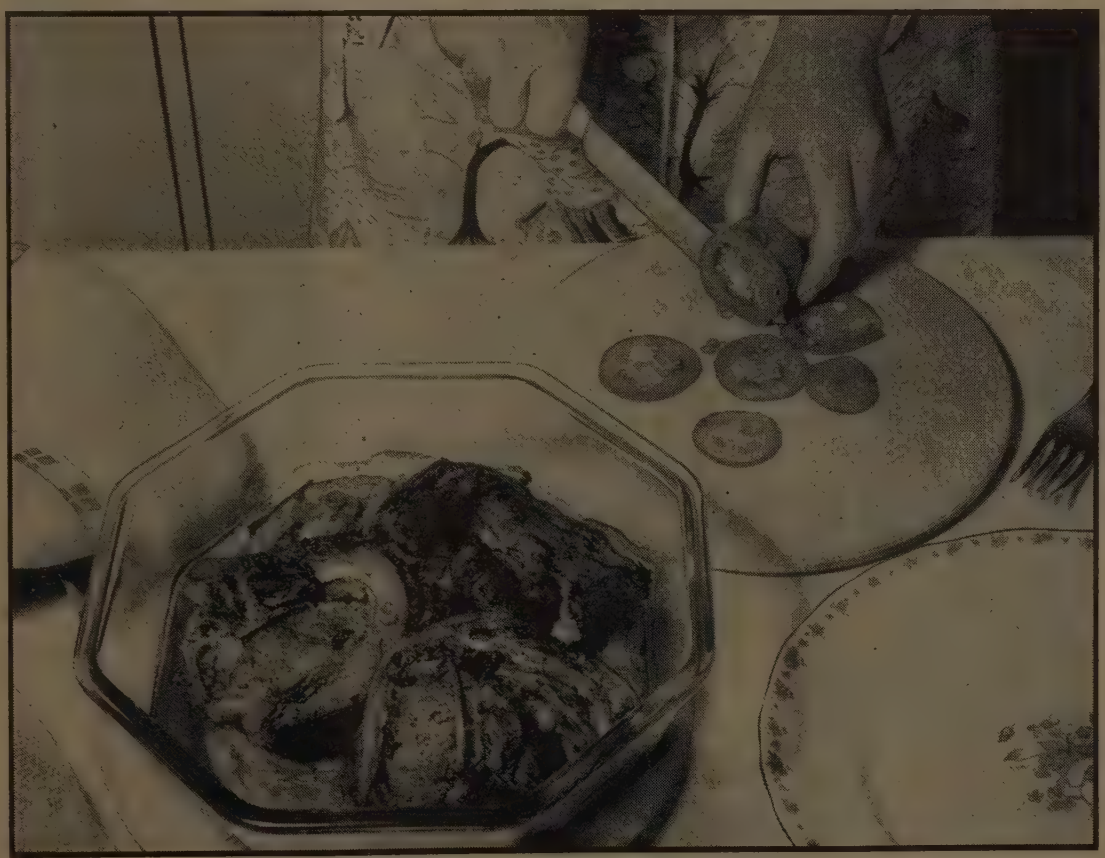
Mixture 2

2 tablespoons of madeira
1 teaspoon of red currant jelly
A few sliced mushrooms
Cornflour (if necessary)

Mix all the ingredients in mixture 1 and simmer gently for 10 minutes. Remove the fowl pieces and the herbs. Add mixture 2 and if necessary thicken with a little cornflour. Cook for 3 minutes. Add the fowl pieces and simmer for 15 minutes. (6 to 8 servings.)

Jugged Hare or Rabbit

1 hare or rabbit cut in joints
1 teaspoon of grated nutmeg
1 onion, sliced
2 cloves
2 sprigs of thyme
2 wine-glasses of port
2 wine-glasses of madeira
2 slices of bacon



Chops baked in wine are garnished with tomato slices.

You can't go wrong with these two recipes . . .

SULTANA CAKE

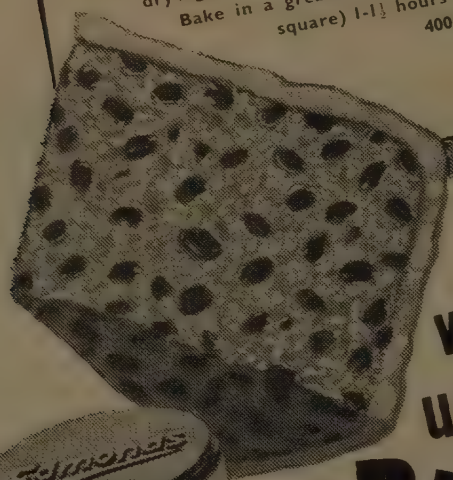
6 ozs. butter
3 eggs
1 teaspoon Edmonds baking powder
6 ozs. sugar
8 ozs. flour
8 ozs. sultanas
2 ozs. peel

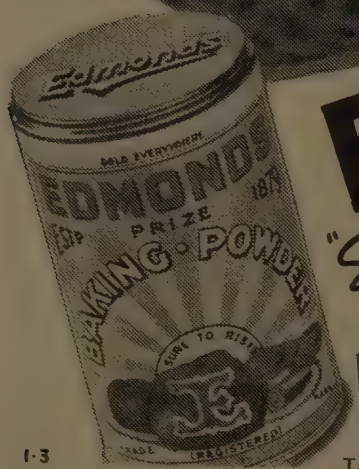
Cream butter and sugar. Beat the eggs and add alternately with sifted dry ingredients. Add prepared fruit. Bake in a greased tin (7 inch square) 1-1½ hours at 400 F.

BLANCMANGE

2 rounded tablespoons Edmonds Corn-flour
1 pint milk
2 tablespoons sugar
1 teaspoon butter
Essence of Vanilla or Lemon

Mix the cornflour to a smooth cream with a little of the milk. Add sugar to the remainder of the milk and heat. Pour on to the mixed corn-flour, then return to the saucepan. Add butter. Stir until the mixture thickens and cook 10 minutes longer. Add essence and pour into a wet mould. Leave until set.





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Put all the ingredients except the bacon in a deep casserole and allow to stand for 4 hours to 6 hours. Remove the joints and flour them lightly. Brown in hot fat. Pour off the fat. Add the bacon and cook for a minute or two. Add 1 cup of water or stock and then all the ingredients from the casserole. Cook for 1 hour and serve in the casserole with a garnish of red currant jelly. (6 to 8 servings.)

Fish

Baked Fish

2lb. of fish cut into steaks
1 cup of olive oil
1 cup of dry red wine
1 teaspoon of finely chopped shallot
Salt to taste
Pepper to taste
Juice of 2 lemons

Place the fish in a casserole and add the remaining ingredients. Cover the casserole and bake in a slow oven at 275 degrees to 300 degrees for ½ hour to ¾ hour. (6 servings.)

Fish Timbales

(Use either 2 small timbales for each person or a casserole which holds 4 servings.)

1 cup of cooked macaroni
3 cups of flaked cooked fish
2 tablespoons of breadcrumbs
½ onion chopped
1 dessertspoon of chopped parsley
Salt to taste
1 egg, beaten
1 wine-glass of white wine

Grease the timbales or casserole and line with the macaroni. Mix the remaining ingredients thoroughly and spoon the mixture into the timbales. Cover them with greaseproof paper and steam for ½ hour. Serve with a brown sauce (see recipe on page 194).

Crayfish and Rice

1 cupful of crayfish pieces (leg meat is best)
¼ cup of tomato puree
2 tablespoons of butter
½ pint of cream or top milk
1 wine-glass of sherry
1 teaspoon of grated onion
1 cup of cooked rice

Heat the crayfish, rice, butter, tomato puree, and onion together over boiling water for 20 minutes, stirring from time to time to blend them. Add the cream and sherry and stir well. Continue cooking for 5 minutes. Serve garnished with chopped parsley. (4 servings.)

Mussels in Wine

24 mussels
Salt to taste
Pepper to taste
1 teaspoon of chopped onion
1 wine-glass of sauterne
2 slices of bacon cut in halves
Grated cheese

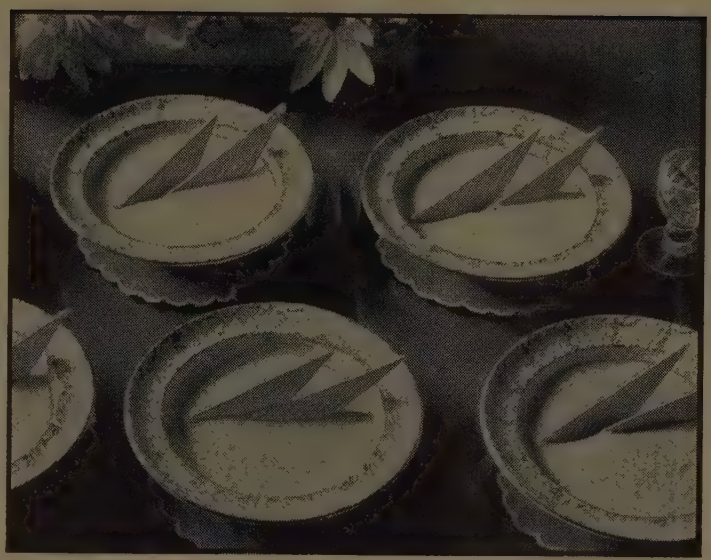
Clean the mussels and place in a buttered casserole. Add the salt, pepper, and onion and then pour on the wine. Cover with the bacon. Bake for 15 minutes in a moderate oven at 325 degrees to 350 degrees F. Sprinkle the top with a little grated cheese and put the casserole back in the oven for the cheese to brown. (4 to 6 servings.)

Sweets

Zabaglione

6 egg yolks
3 tablespoons of sifted sugar
6 tablespoons of sweet white wine

Beat the egg yolks and sugar together until they are thick and lemon coloured. Cook over boiling water, beating all the time while adding the wine a tablespoon at a time.



Zabaglione is an attractive dessert.

As soon as the mixture is just thick enough to hold its shape pour it into warmed dishes and serve with shell wafers.

Banana Cream

¼ pint of milk
4oz. of sugar
3 eggs
½ teaspoon of vanilla
3 bananas
2 tablespoons of gelatine softened in a little cold water
1 wine-glass of sweet white wine

Separate the eggs and put the yolks, milk, sugar, and vanilla into a saucepan. Beat for a minute or two and cook gently until thick. Add the softened gelatine and allow the mixture to cool. Mash the bananas in the wine and stir into the mixture. Lastly fold in the stiffly beaten egg whites. Serve in individual dishes garnished with glace cherries.

Trifle

Sponge cake
Jam (strawberry or raspberry preferably)
1 tablespoon of madeira
1 tablespoon of claret
1 tablespoon of sweet sherry
½ cup of fruit juice or boiling water
1 cup of pouring custard

Cut the sponge cake in neat pieces and spread with jam. Arrange in a bowl and add the fruit juice or boiling water. Sprinkle the wine over the whole. Top with the custard. Garnish as desired. Trifle is best made at least 6 hours before the meal so that the wine flavours and aromas are well blended in it.

Plum Pudding

1 cup of seedless raisins
¼ cup of diced peel
½ cup of diced citron
½ cup of sliced candied cherries
¾ cup of sweet sherry
1 cup of suet
2 cups of fine breadcrumbs
¾ cup of sugar
¼ cup of flour
½ teaspoon of salt
½ teaspoon of ground cloves
1 teaspoon of cinnamon
1 teaspoon of nutmeg
6 eggs, well beaten
½ cup of chopped walnuts

Combine the fruits and soak them overnight in the sherry. Combine the other ingredients and mix well. Add the fruit mixture and mix well. Spoon into a greased bowl and cover well. Boil for 3½ hours. Serve with wine sauce or hard sauce. (12 to 16 servings.)

Pears in Wine

Peel, halve, and core 6 pears. Stew them in a mixture of ½ cup of sherry and 1 cup of water. When nearly done add ½ cup of sugar. When the pears are cooked drain them and arrange attractively in a serving dish. Thicken the juice with a little cornflour and pour it over the pears. Garnish with walnuts. (6 servings.)

Other fruit may be stewed in wine. White wines are most suitable, but red wines may be used with peaches.

Syllabub

1 pint of clotted cream
6oz. of sugar
1 tablespoon of mashed raspberries
1 tablespoon of lemon juice
1 tablespoon of brandy
¼ pint of sherry

Beat all together until thick. Serve cold and ungarnished. (4 to 6 servings.)

Beverages

Posset

1 wine-glass of sweet wine
½ cup of milk
1 teaspoon of sugar
Pinch of cinnamon
Pinch of nutmeg

Heat the milk and add the wine and just bring to the boil. Add the sugar and spices. Serve immediately. The milk should curdle slightly. (1 glass.)

Egg Nog

1 egg
1 tablespoon of sugar
1 cup of milk
3 tablespoons of sherry

Beat the egg, sugar, and sherry with a fork. Add the milk and beat well with a fork. Serve hot or cold. (1 glass.)

Pears in wine and garnished with walnuts are delicious.

Punch

½ cup of sugar
4 cups of hot tea
⅔ cup of lemon juice
6 cups of sauterne or white wine

Dissolve the sugar in the tea and cool it. Add the lemon juice and sauterne. Serve by pouring over a block of ice in a punch bowl. (24 punch cups.)

Sauces

Brown Sauce

1 shallot, diced
1 carrot, diced
1½oz. of butter
1oz. of flour
1 small tomato, chopped
1 pint of stock

Fry the shallot and carrot in the butter. Add the flour and cook until smooth and brown. Add the tomato and cook for 2 minutes to 3 minutes. Add the stock and simmer until the mixture is reduced to two-thirds of the original quantity. This is a good base for many savoury wine sauces.

Espagnole Sauce

2oz. of chopped bacon
1 chopped shallot
2oz. of mushrooms, if available
Sprigs of parsley and thyme, tied together
5 peppercorns
1oz. of flour
2 small tomatoes, chopped
1 pint of brown sauce
1 tablespoon of sherry
1 small carrot, sliced

Put the chopped bacon in a pan and add the shallot, carrot, mushrooms, herbs, and peppercorns. Cook the mixture lightly, stirring to prevent sticking. Gradually add the flour and brown well. Add the tomatoes, brown sauce, and sherry. Bring to boiling point, but do not boil. Remove the peppercorns and herbs. Serve with pieces of left-over fowl or other poultry, rabbit, macaroni, spaghetti, or rice.

Green Sauce

1 cup of white sauce made with fish stock if possible
1 bunch of parsley
1 cup of white wine

Dip the parsley in hot water and then cold water. Shake well and rub through a sieve. Add to the hot white sauce and blend well. Add the wine. Reheat but do not boil. Serve with fish.

Port Wine Sauce

4 tablespoons of brown sauce or stock
2 wine-glasses of port wine
Juice of a lemon
Red pepper to taste
1 teaspoon of castor sugar

Heat all together and boil for 2 minutes. Strain if necessary. Serve with game.

Plum Pudding Sauce

Cream 4oz. of butter and 2oz. of sugar and when the mixture is light and smooth blend in ¼ pint of sherry a teaspoon at a time.

Marmalade Sauce

4oz. of sugar
½ pint of water
¼ pint of sherry
3 tablespoons of marmalade

Boil the sugar and water to a syrup. Add the marmalade and boil for 3 minutes to 5 minutes. Add the sherry and stir in well. Serve with light steamed puddings or baked sponge puddings.

Melba Sauce

½lb. of cleaned strawberries
½lb. of cleaned raspberries
Icing sugar to taste
2 tablespoons of sherry

Mash all ingredients together. Beat in sufficient icing sugar to taste. Finally, blend in the sherry. Serve with ice cream or light gelatine sponge desserts.

Wine Sauce

2 tablespoons of jam
1 dessertspoon of sugar
1 egg yolk
2 tablespoons of milk
2 tablespoons of marsala or other sweet white wine

Mix the jam, milk, and sugar and just bring the mixture to the boil. Beat the egg yolk in the wine and add it to the milk mixture. Reheat very carefully nearly to boiling. This is a general purpose sauce which may be used to improve dull puddings.

All photographs by Sparrow.

Rural Water Supply Amenities in South Canterbury

ONE of the aspects of the work of the Department of Agriculture's Rural Sociologists is to carry out research projects into various rural home problems, and recently Eirene E. Unwin, formerly Field Officer in Rural Sociology, Department of Agriculture, Christchurch, did a survey of the water supply amenities of over 200 rural homes in South Canterbury. In this and two subsequent articles she discusses the problem of home water supply and analyses some of her findings. How far the picture obtained in South Canterbury is typical of the other rural areas in New Zealand only an extended survey could ascertain, but many of the points raised in these articles should prove of interest to all those who dwell in rural, and even in urban, homes.

The main dam in the Tengawai River is a source of supply for downlands water.

ONLY those who live in homes where ample cold and hot water is available at the turn of a tap, and who are so used to their good supply that they take these amenities for granted, will wonder why water supplies should be studied. However, the availability of water is of the same basic importance as the availability of food, clothing, and shelter and is equally important in its effect on man's way of life.

Once an adequate supply of water is assured a family is free to mould its life along lines dictated in some degree by other factors, but scarcity or impermanence of water supply is a factor which plays an increasingly important part in determining a way of life.

In prehistoric times an impermanent water supply was one of the causes necessitating a nomadic life. Shortage of pasture of course also contributed, but if its water supply dried up, a tribe had to move whatever the condition of the pasture. There could be no settling of the land, no development of agriculture, and no growth of cities until a permanent, adequate natural or artificial water supply had been established.

To the country housewife in New Zealand, however, inadequacy of water is not usually the main problem, though this may be so where rainwater is the only source of supply and where storage is inadequate to tide over dry seasons and occasionally under other circumstances. More frequently the presence or absence and the convenience or inconvenience of plumbing and water supply amenities in the house are the chief influences on her pattern of working and indeed the pattern of living of her whole family.

THE SURVEY

Because of the factors outlined questions were included in the questionnaire that aimed to discover how many rural housewives had to manage their homes with the added burden of an inconvenient water supply and in what way the supply was inconvenient. How many were actually short of water, so that they had to consider almost every cupful before using it? How many were handicapped by having to carry all water into the house from a source outside? What did the the country housewife consider the first essentials in water supply—a kitchen sink, a bath, a washhouse, hot water, or drainage? Were there any general differences between farm and rural non-farm houses, between older and newer houses, between those with electricity and those without? From what sources did the houses get their water? Was it liable to contamination? Was hardness a serious problem? How did the size and age of the family affect the essential requirements? Did the position of the house —on the plains, on downlands, or on hill country—make a significant difference?

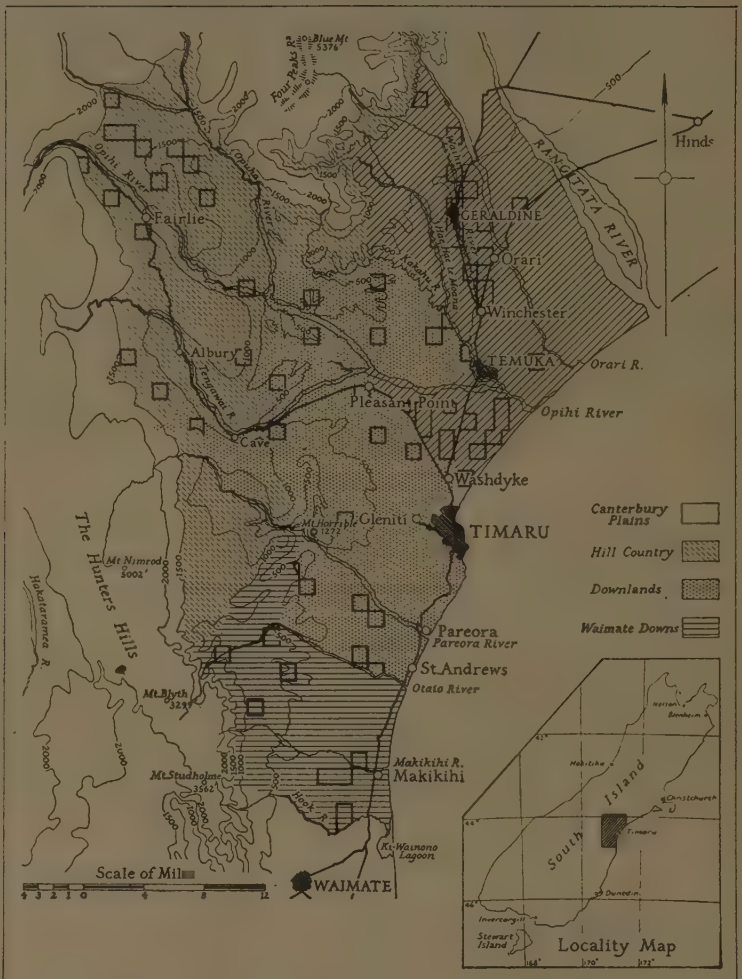
Survey Area and Its Subdivisions

The area surveyed included the southern end of the Canterbury Plains, the rolling hill country to the south of this, and a strip of high or back country between the plains and down country and the mountains. The inland boundary was the 1500ft. contour line approximately, as there are very few if any buildings in altitudes higher than 1500ft. in this part of South Canterbury. The appearance of the land varies considerably. Generally it rises from the coast westward to the hills, but in the northern part the slope is gradual to about 1000ft. This flat district formed the "Canterbury Plains" subdivision of the whole survey area. To the west of this plain, generally from above the 1000ft. contour line, the land rises steeply, and in the Four Peaks Range reaches over 4000ft. To the north and south of this range, however, the heights are not so great.

Further south not only do the hills come closer to the sea as the plain narrows, but the 1000ft. contour line is no longer a clear demarcation between hills and plain. There is a strip of "down country"—low, rolling hills and many small valleys—the great part of which is cultivable. The steeper hill country into which the downs merge to the west generally lacks cultivable land except for small river flats in some of the valleys and on the tops of some of the small, lower hills. At Timaru the downs extend to the sea and the plain narrows away completely. Several miles south of Timaru a second coastal plain begins, but except in small areas it is nowhere as flat as the main Canterbury Plain to the north. It is very narrow, merging quickly again into the down country, which extends, rising gradually, to the Hunters Hills on the western boundary of the area.

The steep hill country approximately between the 1000ft. and 1500ft. contour lines formed another subdivision of the area. There was probably more difficulty in providing the homesteads with water here, as ground water would not be easily accessible, a difficulty which was expected also in the low hill country areas; indeed there was much more variety in types of water supply in the hills than on the plains.

The low hill country was subdivided into two areas, because surrounding Timaru and inland from it a piped water supply scheme serves homesteads and stock troughs over an area of some 184,000 acres, which obviously had to be considered separately from the remaining down country. This Downlands Water Supply Scheme is a highly successful venture which has revolutionised living and farming conditions in many areas. The map shows the boundaries of the area. The irregularity of the inland boundary is mainly due to the fact that here it is fairly close to the intake, and the water pressure is not great enough to



[*Map by Department of Lands and Survey*

The district covered by the survey, its position in the South Island, and the four subdivisions. The small squares show the areas where the houses were visited.

serve any houses which are above a certain altitude. Generally the downlands supply area covers the northern section of the low hill country. The southern section of this, with the narrow coastal plain and all the land to the 1500ft. contour line, formed the fourth and remaining subdivision of the survey area. It has been called for convenience the "Waimate downs area", as Waimate is the nearest township of any size.

The Sample

Of the 226 houses visited results from only 200 were used in the analysis. These were made up of 104 in the plains area, 25 in the hills, 48 in the downlands, and 23 in the Waimate downs area. It would have been very difficult to discover exactly the total number of houses in the whole survey area, as it covered parts of three counties (Geraldine, Mackenzie, and Waimate) and the whole of Levels County. It was estimated that there were approximately 2500 houses outside boroughs and towns, of which the 200 visited and the results from which were analysed made up a sample of approximately 8 per cent. It was not possible in practice to ensure that this sample was completely random, but it is probably near enough to be taken as such when the results are interpreted; that is, though the percentage results given in the tables apply strictly only to the 200 houses analysed, it is fairly safe to assume that had the whole 2500 been visited the percentage results would not have been very different, because the sample taken did represent a good cross-section of the total.

Sources of Water

The following sources of water for human use are common: Rain-water (drained from some small catchment area other than the ground, such as a roof); surface or "upland surface water" (from lakes, ponds, rivers or streams, irrigation canals, water races, or artificial dams); and ground water (from springs and shallow or deep wells). Water from each source tends to have its own typical characteristics as to quality, permanence of supply, and general suitability for household purposes, though local conditions are always important in producing special characteristics.

Rain-water

Rain-water collected on the roof is always liable to contamination with dust and bird droppings, perhaps soot, and also paint if this is old and beginning to flake off the roof. Paint could be dangerous only if it contained lead, which is not usual with roof paints. It is possible to fit a device into the downpipe which discards the first gallon or two of rain which falls on the roof, that is the "washings" of the roof, but none was found in the survey. The water may also be filtered before or after it enters the storage tank, and several shingle filters were found being used; as long as these filters were looked after and cleaned often enough, the water was probably reasonably pure.

The big advantage of rain-water of course is that it is very soft and, apart from bird droppings, is not liable to animal pollution; that is, as long as the storage tanks are properly protected. Its chief drawback is that because the rainfall is intermittent, large-volume storage tanks are necessary to tide the household over dry periods. As it is simplest usually to build these large tanks below the ground, the water has to be pumped up again from them if it is to be piped into the house. Some device for securing pressure is also necessary.

Of the 19 homes which relied on rain-water few had a supply which could be termed satisfactory in every way. The most satisfactory had underground, concrete lined and covered tanks, and the water was filtered through shingle before entering the tank and was pumped up again with a power pump to another tank high enough to provide quite strong pressure. (The importance of pressure is discussed later.)

Upland Surface Water

Upland surface water is widely used as a source for town supplies in New Zealand, but in such supplies the catchment area is either protected against humans and large animals or the water is filtered or otherwise purified. When it is realised that streams and rivers are the natural sewers for the areas they drain it will be realised also how very important is the protection of the catchment area and the water channels from both human and animal contamination, or, if this is not possible, the provision of some efficient purification treatment. Such precautions are rare when individual farms get their supply from rivers, water races, or streams, and this is serious, especially in hilly country, where upland surface water

[*Auster Airviews*

A hill country farm. Many such farms rise to more mountainous country than is shown here.

is a common source of supply for farm homes.

The common idea that running water purifies itself is not true. A case is known of a river still being polluted 12 miles downstream from the source of contamination.

In large rivers and lakes there is a good chance of high dilution of any contamination, but since large rivers drain a large area, there is still a grave risk of serious pollution by domestic sewage from houses, by drainage from cow or sheep yards, or from dip discharge; also, when a domestic supply is taken from a little stream or a water race for stock (such water races are common in South Canterbury), the danger is very great indeed. There is always the great risk of pollution by germs harmful to man and, especially in sheep country, a grave risk of hydatids. These risks also make stream or race water highly unsatisfactory for cleaning dairy utensils, and even as drinking water for stock such water must be regarded as a possible source of disease and worm parasites. Only when the supply is piped from an intake well up in a hill stream gorge which is inaccessible to any domestic animals is there a fair chance that the water will be pure.

Ground Water

Ground water is obtained from three sources—springs, shallow wells, and deep wells. The technical difference between the two types of wells is that, whatever the actual depth of the well in either case, a shallow well does not penetrate the first impervious layer beneath the surface of the ground, and deep well water comes always from below an impervious layer.

In New Zealand springs are often found in hilly country, though sometimes the only indication of a potential spring is a seepage or boggy place on the hillside, or a patch of always green grass or extra luxuriant growth. Such places may frequently be developed into very satisfactory flowing springs, and indeed it is doubtful whether springs are fully exploited for water supply in areas where other good sources are lacking. Twelve houses surveyed relied on springs and 19 on rain, and it is probable that in some at least of the latter spring water would have been available had it been seriously looked for. Springs can provide a safe water supply as long as they are properly sited and properly protected with an animal- and boy-proof fence. Proper siting depends mainly on the same factors as are described later for a shallow well. A drawback to some spring water is that it may contain dissolved minerals which make it hard or otherwise undesirable. (For dealing with this problem see articles "Making the Best Use of the Household Water Supply" in the "Journal of Agriculture" for February and March 1952.)

Shallow wells tap the subsoil water. Pumping from them lowers the level of the water table adjacent to the pump and an inverted "cone of depression" is formed. Thus the normal direction of flow of the subsoil water may be reversed, and water will tend to flow in toward the well from all sides, from a distance over a hundred times the depth of the depression. Thus when a well is being sited the following precautions must be taken. The well should be at least 100ft. away from any source of contamination, such as a pit earth closet, drain, septic tank outflow, or stock yard. The normal flow of the ground water should be away from the well down toward any source of danger. The inside of the well should be cased with an impervious layer for several feet down from ground level, and the surface of the ground round the well should be similarly covered with an impervious layer for a radius of about 6ft.

Together these precautions prevent spilt water or rain from carrying

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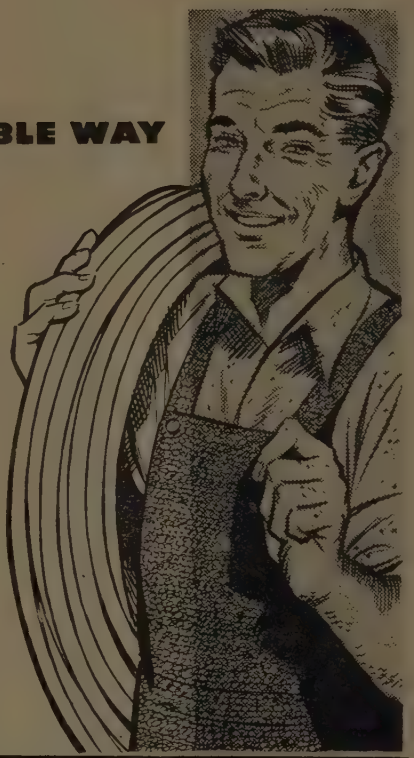

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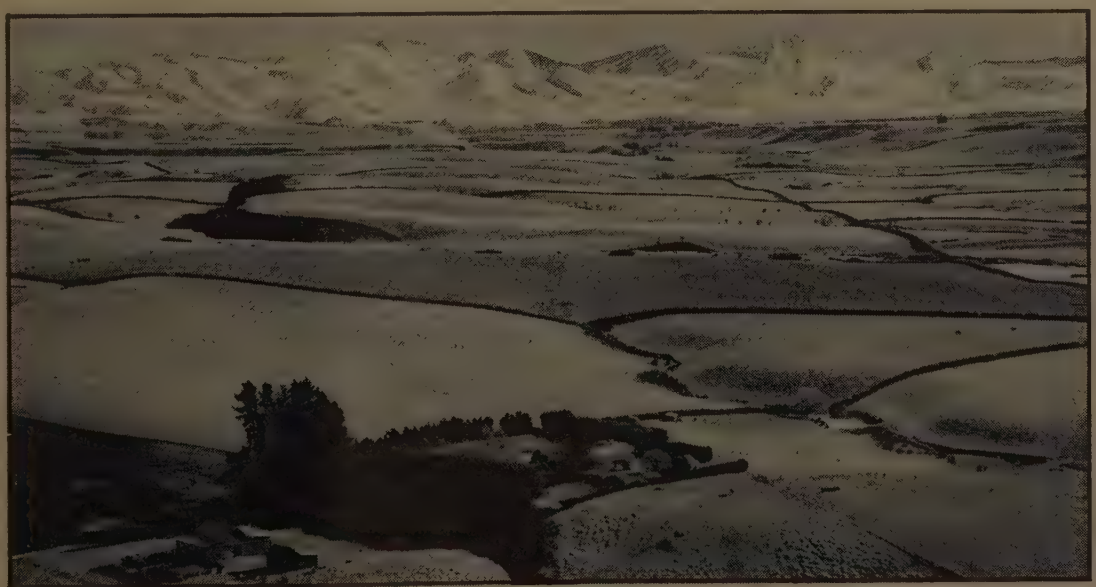
surface washings down into the well from the ground immediately above and surrounding it. Water percolating down from further away is usually adequately filtered by the soil. The well should be on raised ground to prevent flood water flowing into it and the coping should extend 1ft. or 2ft. above the ground. The well should of course have a rain- and dust-proof covering.

These rules apply to a driven, drilled, or dug well, but unless the well is dug the bore pipe itself forms both the impervious lining and the coping and the attachment to the top of the pipe effectively covers the well. Nevertheless, the ground immediately surrounding the bore should still be covered with an impervious layer, such as concrete, for surface water tends to trickle down the outside of the pipe and reach the subsoil water without being properly filtered by the soil. This is particularly liable to happen when before the well was bored a hole was dug at the site to facilitate the boring. Such a hole is usually filled up again with boulders or shingle, through which surface washings will trickle particularly easily and so down outside the pipe to the water.

Unfortunately the need for all these precautions is seldom realised, and in some of the cases surveyed where shallow well water was used adequate care had not been taken to protect the supply from contamination. In a few cases serious pollution, because of improper siting, was highly probable. There is no quick and easy test by which impurity of water may be discovered, and it is easy to be misled by a clear, sparkling appearance, which is no guarantee that the water is pure. It is highly probable therefore that though serious illnesses such as typhoid or dysentery do not often

[*Department of Scientific and Industrial Research*

Testing a well for yield of water during drilling. Geological knowledge is necessary for selection of the best sites for drilling wells for water, particularly in hilly country.



[*Auster Airviews*

Low hill country typical of the area served by the downlands water supply and of the Waimate downs subdivision. The Hunters Hills are in the distance.

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occur through contaminated water supplies in New Zealand, many minor illnesses among farm families, such as septic sore throat, various digestive upsets, and diarrhoea, may be due to this cause. As shallow well water is available and widely used in rural homes over most of the alluvial plains in New Zealand, and often in river valleys and dry gullies in hilly country, adequate protection of such water from contamination is important.

Deep well water is usually bacteriologically pure because it must always have travelled long distances underground and will have been well filtered in the process. On the other hand it is particularly likely to have a high proportion of dissolved mineral salts (see reference already given to articles in the "Journal" for February and March 1952), and a number of housewives visited did complain that their water was hard. It must not be forgotten that deep well water can be contaminated from the surface, especially in dug wells, which should be constructed with all the protections necessary for shallow dug wells—impervious lining at the top and over the surrounding ground surface, coping extended above the ground, satisfactory cover, and so on.

It is unfortunate that so many people in New Zealand rely so implicitly on the powers of water diviners when planning to bore or dig for deep water. Though at times apparently authoritative sources recommend the judicious use of their services, there is ample evidence to support the statement that any controlled tests that have been carried out invariably discredit the powers of the divining rod. Undoubtedly many diviners are completely sincere in their belief in their own powers, but if they appear to be widely successful, it is probably due more to intelligent guessing, aided by a knowledge born of experience of likely places for water, than for any other reason. It would be safer to seek the advice of a geologist than a diviner, however, and probably less expensive!

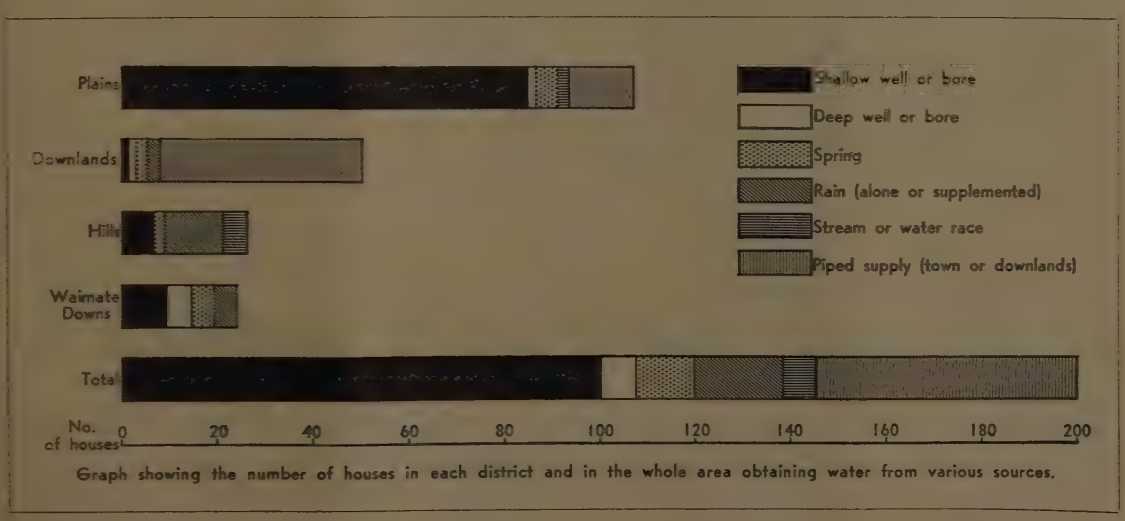
Water Sources in Survey Area

As was expected, in the survey area there was a noticeable variation of source of supply between the districts, as shown in Table 1 and the graph on this page. On the plains 84 (81 per cent.) of the houses visited obtained their water from a shallow bore or well, the water being pumped to the surface by power or by hand; in the hills only 6 (24 per cent.) did this, and in the Waimate downs area 9 (38 per cent.). On the other hand in the hills area 12 (48 per cent.) relied on rain only or rain and some supplementary source more or less adequate, 5 (20 per cent.) obtained their water from a stream or stock water race, and the remainder from springs. In the Waimate downs area 5 (22 per cent.) relied on rain or mostly rain, another 5 on deep bores, and the remaining 4 (18 per cent.) on springs. In the downlands area of course the

Wind power for pumping is cheap, but now it is not used as commonly as it was before the use of electricity. Where electric reticulation is lacking wind power is still used to provide water under pressure for house and stock. Unless this equipment is supplemented by a small power pump, much hand pumping will be required in a windless season.

TABLE I—PERCENTAGE OF HOUSES IN EACH DISTRICT AND IN WHOLE AREA OBTAINING THEIR WATER FROM VARIOUS SOURCES

Source of house water supply	Plains per cent. (100 = 104)	Downlands per cent. (100 = 48)	Hill country per cent. (100 = 25)	Waimate Downs per cent. (100 = 23)	Whole area per cent.	No.
Shallow well or bore	81	2	24	38	50	100
Deep well or bore	1	2	—	22	3.5	7
Spring	4	4	8	18	6	12
Rain only or supplemented	—	4	48	22	9.5	19
Stream or water race	2	—	20	—	3.5	7
Piped supply	13	88	—	—	27.5	55
						200



Graph showing the number of houses in each district and in the whole area obtaining water from various sources.

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majority of the houses, 42 (88 per cent.), received the piped supply of water. Most of the others had had a good supply from springs or bores before the downlands water was laid on; in these the downlands water was not used in the homestead, though it usually was for stock. Near the larger townships on the plains a number of houses obtained their water from a local town supply.

Whatever the source of water it is possible by purification, storage, mechanical devices for increasing the pressure, and so on, and with interior plumbing, to supply a household with sufficient good water for all its needs at points where it is required, but the amount of work and expenditure necessary varies with the type of water supply originally available. The extent to which the natural difficulties are overcome by treatment of the original supply will dictate the adequacy and convenience of the final supply for the housewife.

Pressure and Pumping

Obviously the treatment necessary varies with the source of supply, but in all cases it is necessary before the water can be piped into the house to ensure that it is under pressure if hot and cold running water are required.

If it is not continuously available in pipes and under pressure it has to be carried into the house in buckets, and this at once deprives the housewife of a great many of the modern conveniences which a town housewife tends to take for granted.

Natural pressure can be used when the water is piped down from a high source such as a spring, and of course all town supplies and other public supplies (such as the downlands water) are made available at the house under pressure, though most or all of the advantage of this can be lost if the water is not treated properly, as explained later. In all other cases where the water is at or below ground level some device is necessary not only to lift the water to the surface but to step up its pressure to a useful level. By far the most common method is to raise the water to a high tank or reservoir by means of a pump, preferably a power pump (see illustrations on this page). The other method is to use a direct pressure pump (in the survey about a quarter of the houses using electricity for pumping had pressure pumps, that is pressure was built up within the pump itself without the use of a high tank).

Houses with electricity have an advantage when pumping is necessary, though in the survey more than two-thirds of the houses which had to pump water to the surface and were without public supply electricity still used power-driven pumps of one sort or another to increase the pressure of their supply. Though it is possible through very hard work to pump water by hand to a high tank from which it may be piped down again under pressure into the house, in practice most houses pumping water by hand use the pumps only to lift the water to the surface and not to raise it to a height to provide a continuous pressure supply. Only with a power pump can the two operations of raising the water to the surface and of stepping up its pressure be achieved.

A small electric pump (inset) used to raise water to a tank on a high stand is by far the most common method of providing water under pressure. Pressure would depend on the height of the tank.

When water is pumped into a high tank, or when a high-pressure supply is piped to a tank with a ball-tap, the final house pressure depends on the height of the tank, not on the strength of the pump or of the original high pressure. Most of the tanks seen were about 10ft. up, which height gives quite a satisfactory pressure for most household purposes. A few people pumped their water to high reservoirs, which of course gave real high pressure (see lower illustration on page 204), but a number of tanks were or had been rain-water tanks, and the tops of these of course had to be below the level of the lowest corner of the roof. In many places they were just high enough to provide pressure sufficient for a hot water system, but in many the outlet from the tank was below the level required for even cold water taps inside. This meant that the water could not be piped into the

A view across part of the Canterbury Plains toward the downs country and the Hunters Hills. [*V. C. Browne*

house, and had to be carried in, the only tap being outside, low down at the tank.

In a few cases the rain tank would have been high enough to give minimum adequate pressure for a plumbing system, but this had not been installed and all the water was still carried in by hand. In several houses relying on rain the water was stored in large underground cisterns and then either pumped to the surface by hand or up to a high tank with a power pump, but in others, though rain was no longer the source of water, the old rain tank was still used. Under the downlands scheme a break-pressure tank must supply the house, and where the old rain tank had been used for the break-pressure tank nearly all of the potentially high pressure of the supply was lost. In a few houses water from the downlands supply was led into an old rain tank with only one tap from it, that is, the water was not piped into the house, so that no use at all was made of the potential pressure. In such houses the amount of water used was probably not many gallons more than in the days when rain-water was used, as all water still had to be carried.

At a few houses where a spring had been tapped pressure was supplied merely by gravity feed from the source. Some of those on town supply had no break-pressure tank and utilised all the pressure available, but they had no storage to tide them over breakdowns in the supply.

The numbers of houses surveyed using the different methods of getting pressure are listed below:—

No pressure (hand pump or tap outside at tank) ..	24
Low tank (rain-water, or break-pressure for downlands)	26
High tank	110
High reservoir	4
Electric pressure pump ..	24
High source	7
Direct pressure from town supply	5

The numbers using different motive powers for pumping for getting pressure were as follows:—

Electric	81
Wind	13
Ram	6
Petrol	7
Tractor	2
Water-driven pump	1

Of the 81 pumping by electricity 2 had their own generators and 79 used public supply electricity. A total of 98 houses with public supply electricity needed to pump water, and 7 of these had power pumps using non-electric motive power, probably all installed and working satisfactorily before the electricity was available. This meant there were 12 houses where water was pumped by hand only, though electricity was available. On the other hand, of the 33 houses where water had to be pumped, but where electricity was not available, there were only 9 hand pumps.

This 5000-gallon tank has been built on a rise high enough to give ample pressure for house and stock. The water is pumped to it by electric power. Even if 200 to 300 gallons are used daily, it holds several weeks' supply.

Storage

Whether or not a tank is used for obtaining pressure, and whatever the source of supply, it is

wise to have provision for some storage of water to tide over periods when the supply may be cut off for some reason or other. Anyone who has at any time suffered from a sudden and acute shortage of water will appreciate the value of storage, particularly if they are used to an ample supply and the whole household has been able to use as much water as is needed at any time.

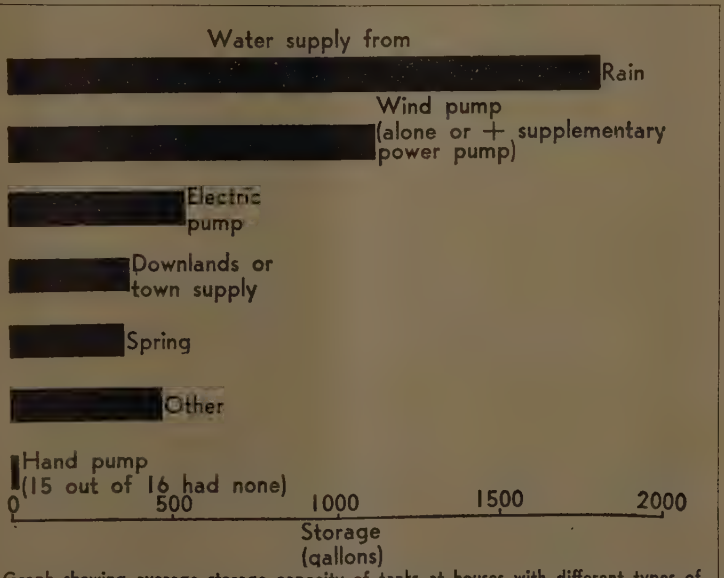
There was much variation in the size of the storage tanks of the houses surveyed, many with automatic electric pressure pumps having no more than about 20 gallons in the pressure tank of the pump, while others, relying solely on rain-water, had several thousands of gallons stored below the ground. By far the most common storage tank was the 400-gallon size, which in an emergency could be made to last an ordinary household a week if the water were used carefully. There were quite a number of smaller tanks which would not tide over many days' shortage.

Even with an electric pump a few hundred gallons' storage is advisable, as power shortages may cause electricity cuts, or snow in the high country may break the supply lines during a bad winter. With a ram in a stream or a race there is the same danger of a breakdown as with a high-pressure supply from a river, namely a washout or blockage at the intake such as may occur in a flood, though of course with a ram everything is on a much smaller scale. A few houses relying on one or other of these methods had less than 400 gallons' storage and some had none.

If wind is insufficient, a wind-driven pump at a bore or dug well will not provide a sufficiently continuous supply for a small tank to be adequate. A supplementary method of pumping such as a small petrol-driven engine gets over the difficulty. At only some of the houses where wind was the main motive power was there an alternative method of pumping other than by hand. The figures giving average storage capacity for each type of supply (see graph below) show clearly that the less reliable is the supply the greater is the capacity

TABLE 2—NUMBERS OF HOUSES WITH STORAGE TANKS OF VARIOUS CAPACITIES AND DIFFERENT METHODS OF OBTAINING WATER

Type of supply	Total houses	No storage	Less than 80 gals.	No. of houses with 80-200 gals.	250-600 gals.	650-1000 gals.	1050-2000 gals.	More than 2000 gals.
Rain	19	—	—	1	2	5	3	8
Wind pump (bore)	8	—	—	1	3	3	1	—
Wind and some other pump	6	—	—	—	1	1	3	1
Spring	5	2	—	—	3	—	—	—
Electric pump (bore)	77	—	17	8	36	9	5	2
Downlands or town supply	55	4	3	9	35	4	—	—
Hand pump (bore or well)	16	15	—	1	—	—	—	—
Other (ram, tractor or petrol pump, water wheel)	14	—	—	2	9	2	1	—
Total	200	21	20	22	89	24	13	11
Total per cent.	100	10.5	10	11	44.5	12	6.5	5.5



Graph showing average storage capacity of tanks at houses with different types of water supply. Note: "Other" indicates water pumped by ram, tractor, water wheel, or petrol-driven pump.

When water has to be pumped to the surface by hand, as with this pump, it also has to be carried into the house by hand, which requires much labour and greatly reduces its convenience.

normally provided, but the figures for houses on each type of supply with storage tanks of various sizes (shown in Table 2) indicate that not all with the intermittent supply had storage adequate to tide them over all emergencies.

Interior Plumbing

The purpose of having a pressure supply and storage adequate for any emergency is to make available plenty of hot and cold running water in the house. Without these the housewife still has to do a great deal of fetching and carrying, which is very tiring. Also her household management plan and family living pattern will be considerably different from what they would be were ample hot and cold water available from a tap at the places where they are most frequently used. One indication of this is that with every increase in internal plumbing and water-using equipment considerably more water is used. It has been estimated (1) that when water has to be carried into the house by hand the average amount used per person per day for all purposes is 7 gallons. With one tap only inside, at the kitchen sink, about 13 gallons may be used, whereas with hot and cold water piped throughout the house the figure is about 30 to 35 gallons.

The amenities which turn a labour-making exterior water supply into a good average interior one are a water-heating system, a bath, basin, tubs, and sink, with drains and taps at each, and also a bathroom and a laundry. How the houses surveyed measured up on consideration of these amenities will be discussed in the next article.

Reference

1. "The Farm Water Supply", "Rural Electrification and Electro-farming", March 1932, p. 299.

Child's Dressing Gown Made from an Adult's Gown

WITH woollen materials at a high price, one becomes equally reluctant to discard old woollen garments or to buy new ones. Dressing gowns for small children have always been expensive, and cannot be regarded as essential garments, though they are very useful. When an adult's dressing gown wears out, however, there are usually quite large pieces of good material left, and these can easily be cut and made up again for a child. A pattern can be bought in the desired size or drawn up from the one described here by Norma K. Matson, formerly Field Officer in Rural Sociology, Department of Agriculture, Wellington. It is for a child of 6 years.

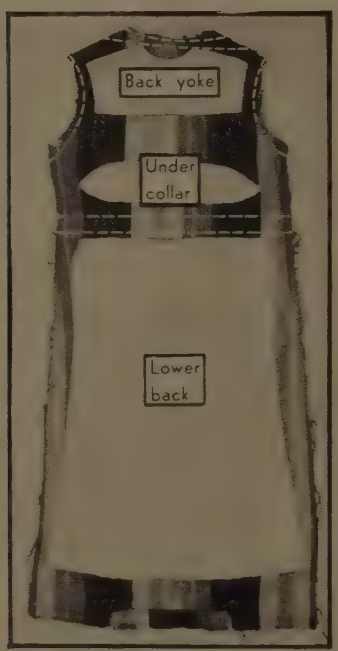
AS a preliminary, consideration should be given to the amount of usable material available from the old garment and what will be needed for the new one. Some of the difficulties described here would not occur if the dressing gown were being made for a 2-year-old or 3-year-old child.

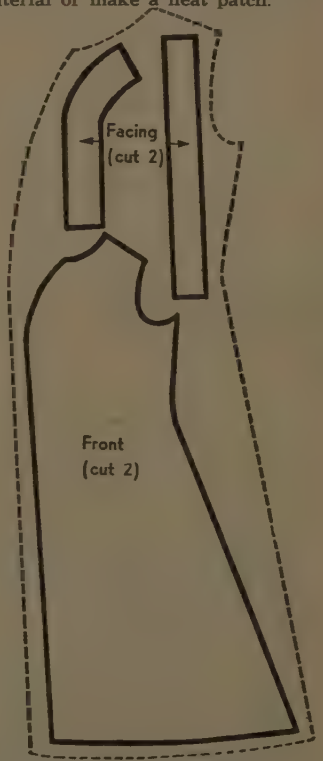
Selection of Pattern

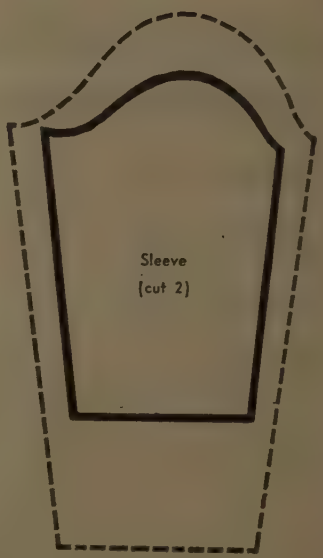
A pattern of similar style to the original is usually a wise choice, as the pieces will fit in better. This applies especially to a princess-style housecoat or one with many panels or insets. From the wrap-around gown with large sections any style may be cut. Sleeves must also be considered. Raglan sleeves which require extra length might be hard to fit in, but the upper and lower sections for two-piece sleeves, though taking more material altogether, can be cut out of smaller pieces than would be needed for a whole sleeve in one, and may therefore be a necessary choice.

Unpicking and Washing

Unpick the old garment carefully. If there is obviously plenty of material, seams and hems can be cut off, with considerable saving of time, but if there is any doubt, unpicking should be done. Use sharp-pointed scissors or a razor blade in a holder. Remove the pockets and other trimmings and unpick the facings, collar and shoulder seams, and any darts or tucks. Take out the sleeves and unpick the sleeve seams. All sections will now be flat. If the material is not to be turned, or if the seams are reversible, it may be possible to avoid further unpicking. Hold the garment up to the light. This will reveal any particularly worn places, which should be marked round with tailor's chalk or a line of tacking. The areas most likely to be worn out are elbows, underarms, round the waist, across the back of the neck, and down the front edges. If there are any small holes caused by burns, tears, or moths marring otherwise good sections, darn them carefully with matching threads drawn from the edge of the material or make a neat patch.







Left—The back of the old garment has been used to provide the back yoke, lower back, and collar of the new garment. Note how the worn areas, indicated by dotted lines, have been avoided. Middle and at right—Sketch layout of the pattern pieces on an old garment of similar style.

Try out the pattern roughly to see how the pieces can best be arranged and if it will be necessary to unpick further. Complete the unpicking if necessary, then brush the garment well to remove any threads and fluff or dust which have accumulated in hems or pockets. Wash, dry, and press all sections, using a damp cloth and being careful not to stretch any edges which are not cut on the straight.

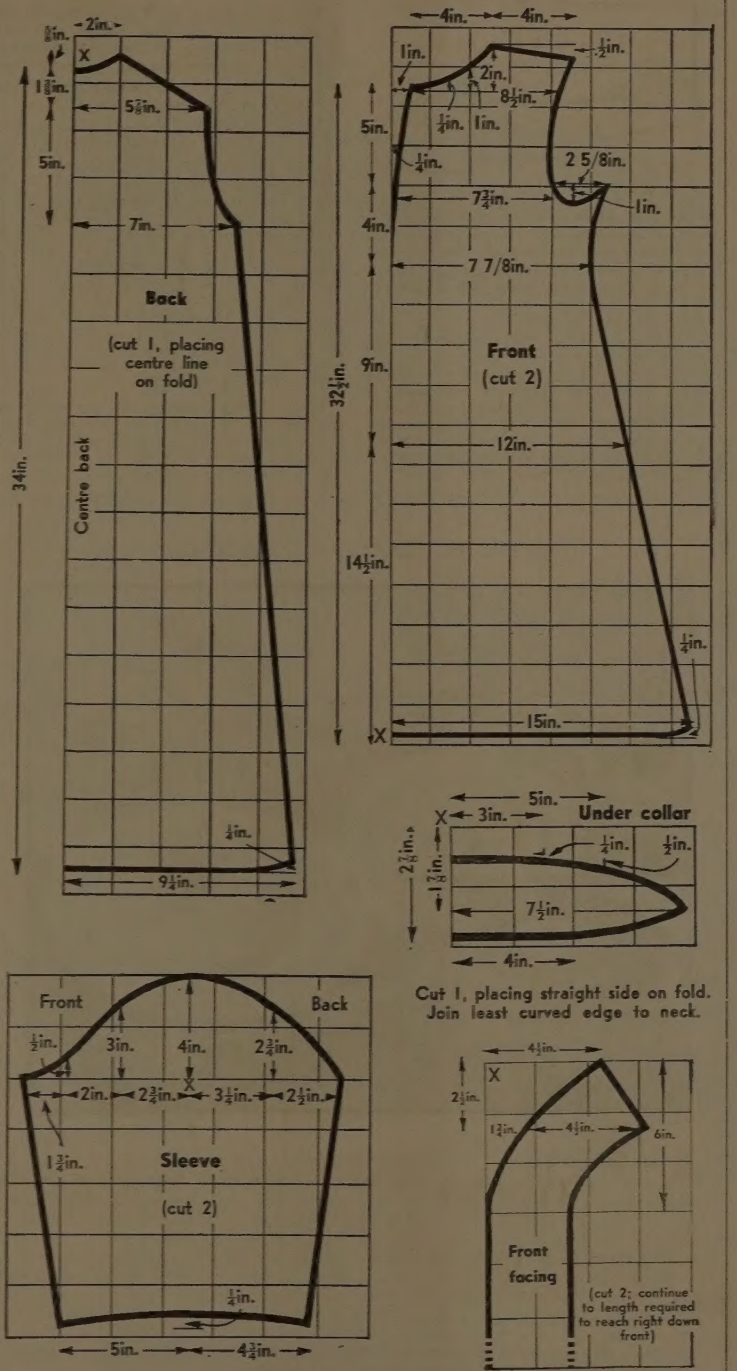
Cutting out

Set out the pattern pieces accurately as planned. If the material is patterned, make sure that it matches in the front sections and is centred on back and sleeves. In general it will be found best to cut each piece from the corresponding section of the larger garment, but worn elbows or badly faded areas may prevent this. It is better to cut all sections separately, rather than two sleeves or fronts together, as the worn areas may fall in slightly different places, and it is easier to make any necessary adjustments in the placing of the pattern on a single layer of material.

Adaptations

Some of the following expedients may be necessary if difficulties occur during cutting out:—

There may be insufficient length to cut back or fronts in one piece (most likely when the old garment is worn out at the waist). Cut the pattern either at the perforations marking the waistline or straight across about two-thirds of the way down the armhole to form a yoke. For example, in the garment illustrated the main sections could not be cut long enough in one place, though there was ample breadth, so yokes were made, back and front. When cutting the material be sure to allow ½in. turnings on each side of the cut made in the pattern. Also, when a yoke is cut make the lower section of the garment a little wider if possible and gather the fullness in to fit the yoke. If there is not sufficient material for this, make the yoke a decorative feature by shaping the edge or trimming it with contrasting binding or piping. A join at the waist, however, should be an inconspicuous plain seam, concealed by the belt.



Pattern pieces for a crossover dressing gown for a 6-year-old child. No hems or turnings are allowed. Each square represents 2in. X indicates the starting points.

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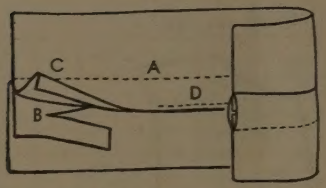


To make a flat seam: A—Sew ½in. in from the edge, right sides together. B—Cut one side away to within ¼in. of the stitching. C—Press the seam flat, wide edge over narrow edge. D—Turn the raw edge under and stitch it down.

On children's garments it is, of course, desirable to have hems which can be let down, but if a facing is required, try to cut and join matching pieces from the material. If this is not possible, cut the facing from some other material of similar colour and texture which has been washed before use. Another method of lengthening is to insert strips of contrasting material, plain or patterned, into the skirt—a wide one about 8in. above the hemline and a narrower one 4in. to 5in. above that.

Try to avoid a join down the centre back, but when this must be done make it inconspicuous by matching the pattern carefully, taking care to allow a ½in. turning where the pattern would normally be placed along a fold.

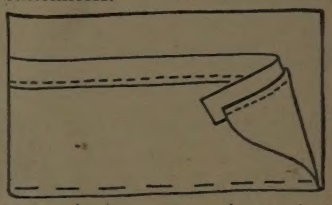
As the original garment is an adult's, the colour and pattern of fabric may not be altogether suitable for a child. Home dyeing could be used to restore faded colours or brighten dull ones, or ¼yd. to ½yd. of an attractive new material used for collar, cuffs, pockets, and facings would make a great difference to the general appearance. Very pretty braids and cords for trimming can be bought by the yard also, but it is not worth spending extra money unless the material is in good condition and the garment can be made long enough to last a growing child more than a year or so.

Decorations such as embroidered initials or a favourite animal motif appliqued on the pocket do not add to expense, but will please the child and add a touch of individuality.

Making up

Most commercial patterns give adequate directions for making up, and these will vary with the style, so no detailed instructions will be included here. For the dressing gown illustrated the following steps apply:—

1. Stitch yokes to the back and front sections.
2. Pin the side and shoulder seams, try the garment on, and make any necessary alterations. Stitch these seams.
3. If bound buttonholes are desired, make them.
4. Stitch the collar to the neck edge. Clip and press the seam so that it will lie flat.
5. Join the facings and stitch them to the front edges, right sides together. Turn the facing to the inside, tack down the edge, and press it carefully.
6. Stitch the sleeve seams and set the sleeves in the armholes, matching the notches.
7. Stitch the pockets in position.
8. Catch down the facing, turn up the cuffs and hem, and finish the buttonholes.

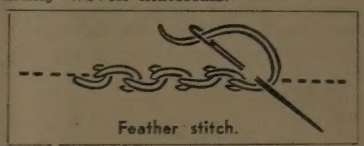


Apply a binding or tape when turning up a hem.

9. Make the belt and stitch tabs for it at the waistline.

Seams

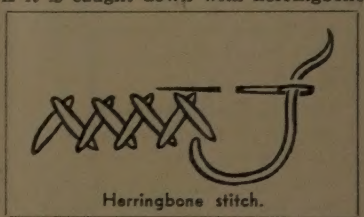
For shoulders, sleeves, and lengthwise seams, flat seams are hard wearing and will give a neat finish inside and out. The step-by-step diagram at top left on this page shows how to make them. If pinking shears are available, plain seams pressed open and pinked are quite satisfactory in firmly woven materials.



Feather stitch.

Hems

The hem of a heavy woollen material will be neater and less bulky if it is caught down with herringbone



Herringbone stitch.

or feather stitch, or finished with a binding, instead of turned under in the usual way. (See diagrams.)

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[*Sparrow*

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—NELL MACPHERSON, formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland

Printed by Blundell Bros. Ltd. (The Evening Post), Wellington—37421

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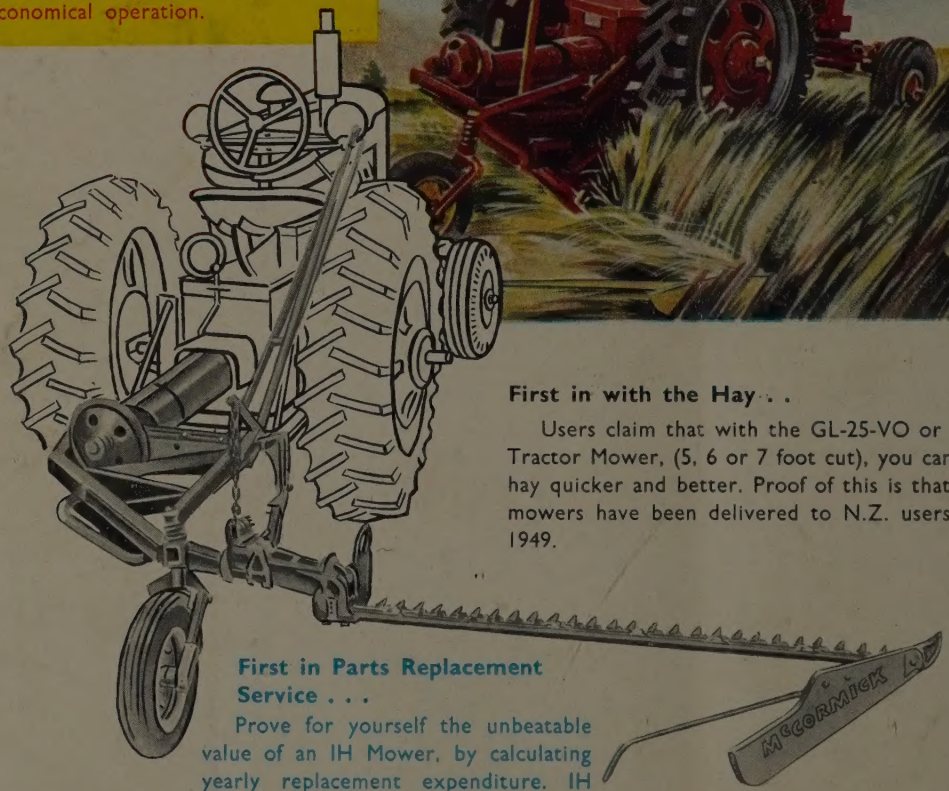

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